CMPM 146 P2 Extra Credit

For this experiment, we ran a series of 3 simulations of 1 game each between the vanilla MCTS implementation and the modified MCTS implementation. In the first round, the growth of both players' trees was limited to .5 seconds. In the second round, it was limited to 1 second. In the third round, it was limited to 2 seconds. The number of nodes in the Vanilla implementation was significantly greater than the number of nodes in the Modified implementation for each time limit. The vanilla MCTS likely generated more nodes because it expands the tree uniformly without the additional computational overhead of evaluating a heuristic, while the modified MCTS spends extra time applying its heuristic to prioritize specific moves. This trade-off results in fewer overall nodes for the modified implementation within the same time limit. Furthermore, for both implementations, the number of nodes for the 2 seconds limit generally doubled the number of nodes for the 1 second limit, while the number of nodes for the .5 seconds limit was generally half of it. From this, we can observe that the tree size is proportional to the time limit.