A.I. Coursework Report

B00317267 & B00328382

# Algorithm

For this project me and my partner decided to use the A\* path finding algorithm to find the shortest path between each node to reach the end goal from the starting point. We chose this as it seemed like the most appropriate algorithm for finding the shortest path between nodes. The A\* algorithm finds the shortest path by finding all the nodes which have edges attached to the current node and cycles through the weights of each edge to find the edge with the least cost of travel and moves along that edge to reach the next node. This cycle is repeated until the end goal is reached and the path is found.

# Justification

We chose to use A\* instead of another shortest path finding algorithms such as Dijkstra’s algorithm as Dijkstra’s algorithm finds the shortest path from the start to all other nodes, whereas A\* uses an estimation of the overall cost from the start node to the goal node known as the “heuristic.” This heuristic makes A\* a more efficient algorithm as it does not check against every single node in the map.

We also chose to use A\* as it is an industry standard and well known path finding algorithm. This makes researching the far easier and finding help during implementation much simpler.

We also chose to use the A\* path finding algorithm as it was the one we spent the most time studying and doing research on when we decided to start working on this project together and it became the algorithm that we most fully understood and from the given lab examples it was the algorithm that we had the most access to if we needed help during development.

# Results

When making the start node: 0 and the goal node: 60 the shortest path which the A\* algorithm can find is:

**0 -> 13 -> 9 -> 15 -> 18 -> 21 -> 25 -> 32 -> 45 -> 46 -> 51 -> 48 -> 50 -> 52 -> 60**

**Cost:** 943

After testing the results with a few different nodes and checking the path and cost of travel we decided not to tinker with the code too much as we were happy that the results we were obtaining were the best results we could get with the knowledge we have gained through the course so far.

# Improvements to the Algorithm

We chose to improve this program by adding the ability for the user to chose the starting and ending nodes of their choice, therefore the user can chose any nodes between 0-63 for the start and goal nodes and the A\* Algorithm will find the shortest path between the two nodes and output the path and cost of travel.

### For Example:

**Start Node:** 0

**Goal Node:** 20

### Result:

**0 -> 13 -> 9 -> 15 -> 18 -> 20**

**Cost:** 401