

## Analysis Document 09

1. Brian Park was my programming partner and he will be submitting the source code of our project.
2. Brian and I have crafted a great relationship through the programming assignments allowing us to spend our time very efficiently in each aspect of the assignment. We often help each other see things in our code or in the logic that isn't as obvious when one of us has been trying to solve the problem for too long, allowing us to understand the algorithms and data structures on a more fundamental level as we create our implementation of the assignments.
3. I believe the straight line distance could affect our runtime especially when you take into account the density of the graph, for instance a very open graph would have a runtime very close to the number of nodes between the start and goal nodes. For a very dense graph the straight line distance would not be very representative of the runtime of our pathfinding.
4. The absolute distance between start and goal nodes allows us to move over nodes that would not be traversed in the BFS. In our BFS we must move around these obstacles to get to our goal node. A good example of a significant difference between the straight line distance and our actual solution is "bigMaze.txt". For the straight line distance we have a line that goes almost straight to the goal so roughly 100 nodes and for the actual solution we must traverse up and then back down as we cross the grid so we have essentially 3 times as many steps to traverse through our grid of nodes.
5. The worst case Big-O runtime concerning a square grid of length  $N$  by  $N$  would have to touch every single node once on the way to the goal(last touched node) and then traverse back to the start through the links( $L$ ) between nodes so we end with up a runtime of  $O(N+L)$  so  $O(N)$ .
6. We spent roughly 8-10 hours on this assignment due to efficient planning and starting the problem on Friday giving us ample time to logically step through each part of the process.