

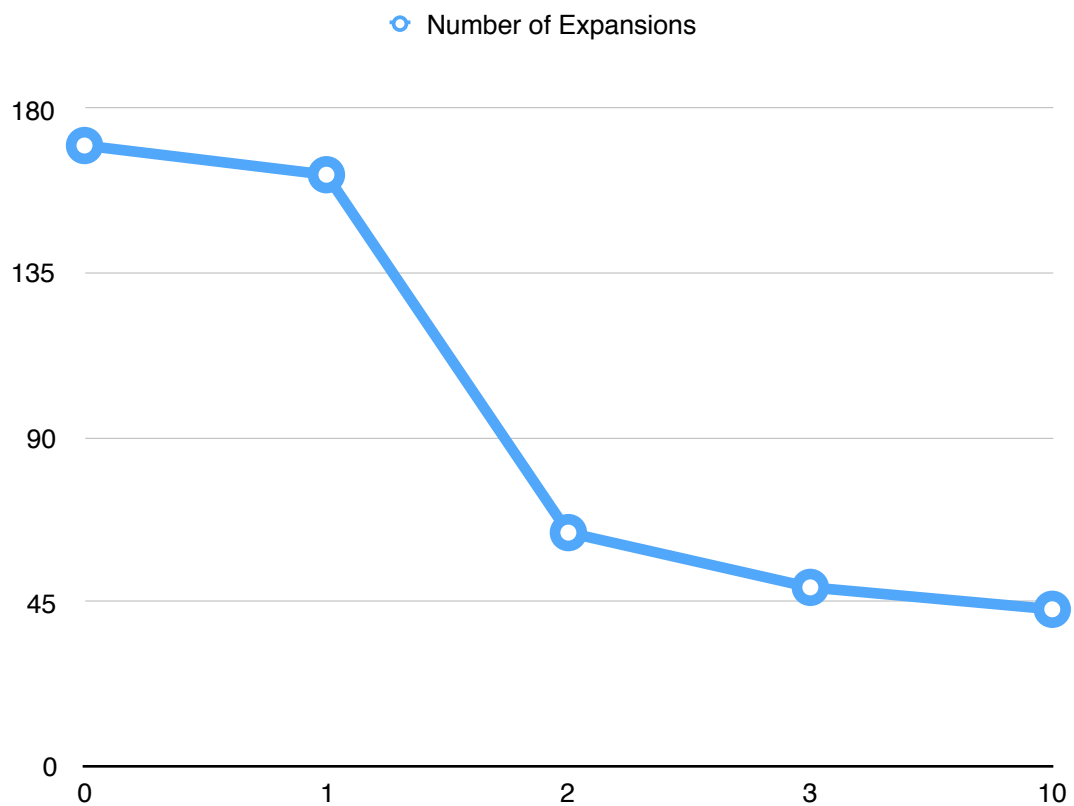
CSCI 360 – Project #1

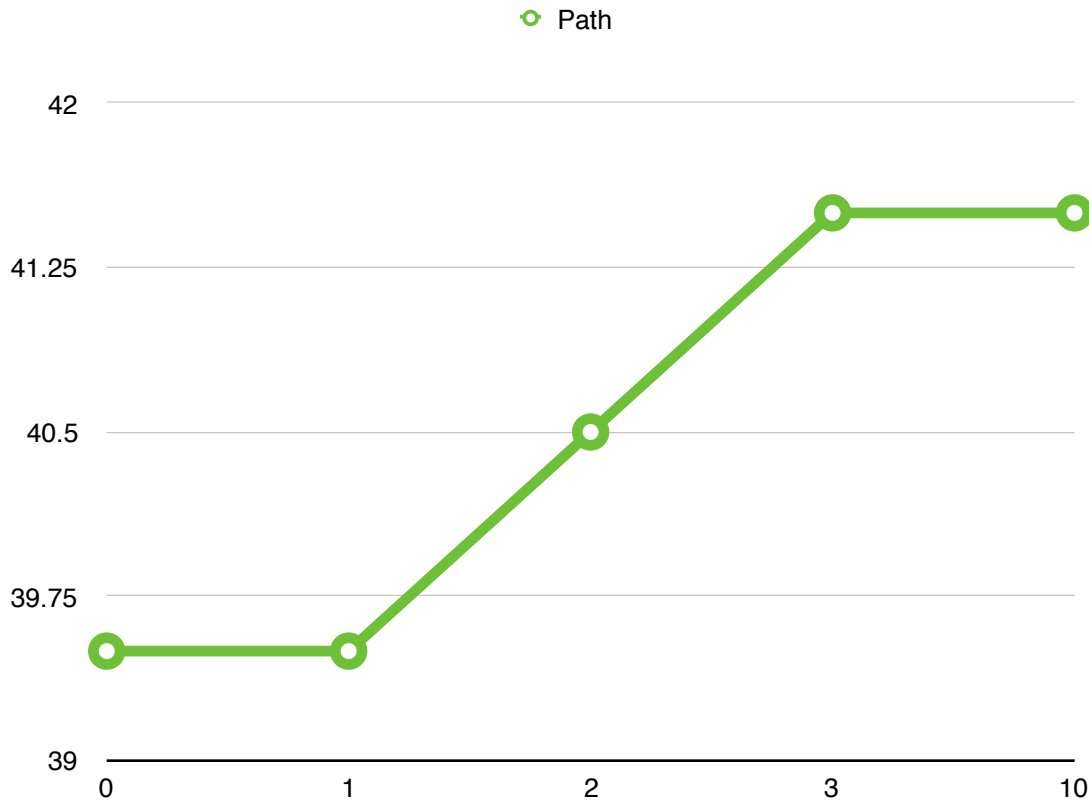
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Part 2 - Experiments with Inflated Heuristics

Weight	Number of Expansions	Path Length
0	170	39.5
1	162	39.5
2	64	40.5
3	49	41.5
10	43	41.5

Experiment Results with different Weights for Weighted A*





What trends do you observe in the number of expansions and resulting path lengths as w varies?

For the number of expansions, between a w value of 0 and 1, there is a slight decrease; as the w value increases for values greater than 1, there is an exponential decay of the number of expansions with respect to the w value.

For the path length, between a w value of 0 and 1, there is no change; as the w value increases for values from 1 to 3, there is a small linear increase in the path length, capping out from 3 onwards and remains unchanging.

For which values of w is Weighted A* guaranteed to find the shortest path? For which values of w is Weighted A* not guaranteed to find the shortest path (and why)?

For w values of 0 and 1, Weighted A* is guaranteed to find the shortest path since the g and h values are being evaluated on equal terms, allowing for fair expansion of nodes that may allow for the best shortest path. For any w values greater than 1, Weighted A* does not guarantee shortest path since the weight will remove a portion of the possible expansions and re-considerations of the paths from the algorithm.

What can you say about the length of the resulting path as w increases? Why you think that this is the case?

The path length will increase very slightly as w increases. This is most likely due to the fact that when more weight is being put on the heuristic, a larger portion of the f value will come from the heuristic, and thus, making A^* expand more aggressively according to the heuristics and consider the optimizations of the paths from the g values less. This decrease in path optimization and ignoring the making the g -values matter less will cause A^* to not consider every single possible option, and thus not guaranteeing the shortest path; as w increases, more and more paths are being ignored for reconsideration and thus the path length will increase.

What can you say about the length of the number of expansions as w increases? Why you think that this is the case?

The number of expansions exponentially decreases after a weight of 1. When we have the extra weight on the f value and when we look at an expansions that has already been expanded before, this weight will push the reconsideration to be more likely to be ignored due to the increased f value. This ignoring will not place the vertex back into the list to be expanded, and thus lowering the total number of expansions. The exponential decay is caused by the fact that many of the f values have very small differences, and thus one increase in the w value will cause a large number of vertices to be ignored.