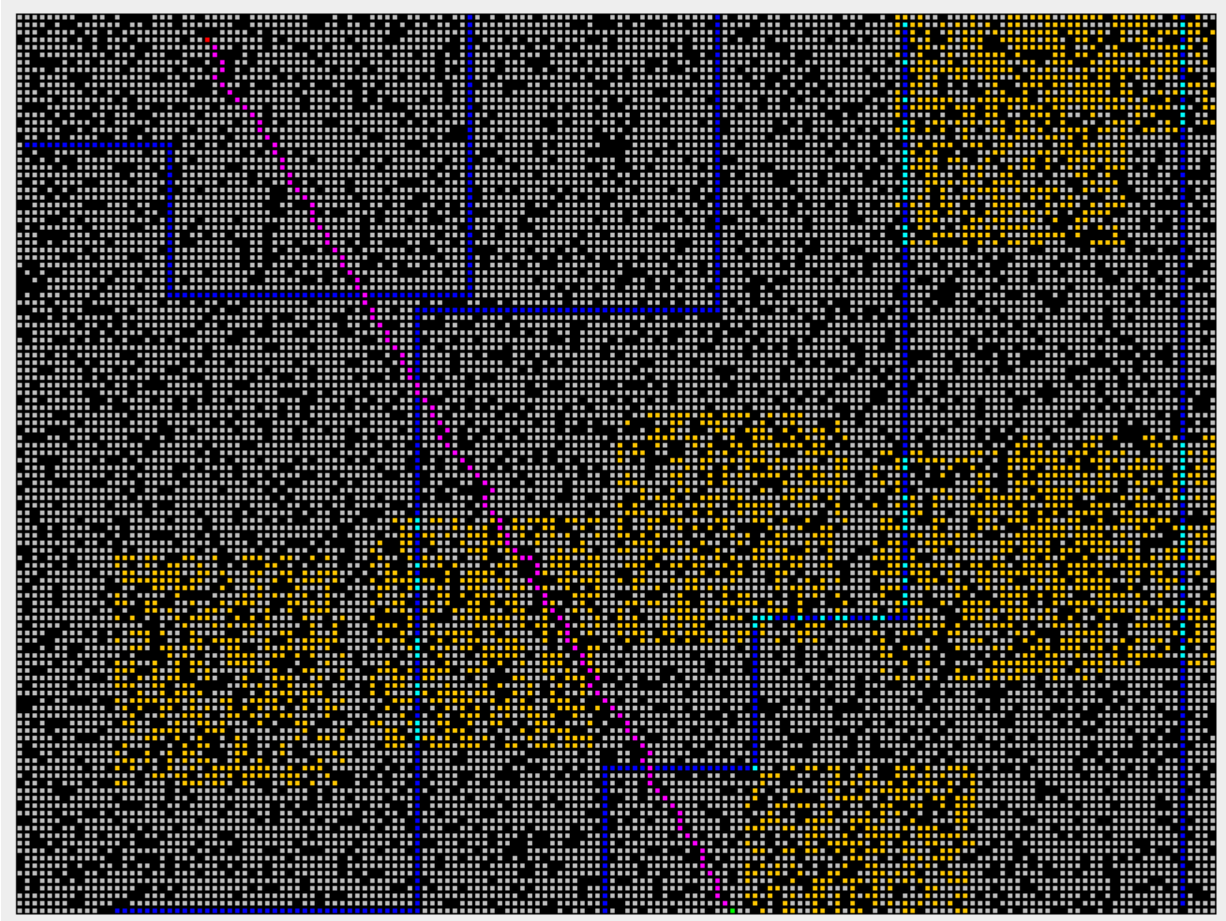
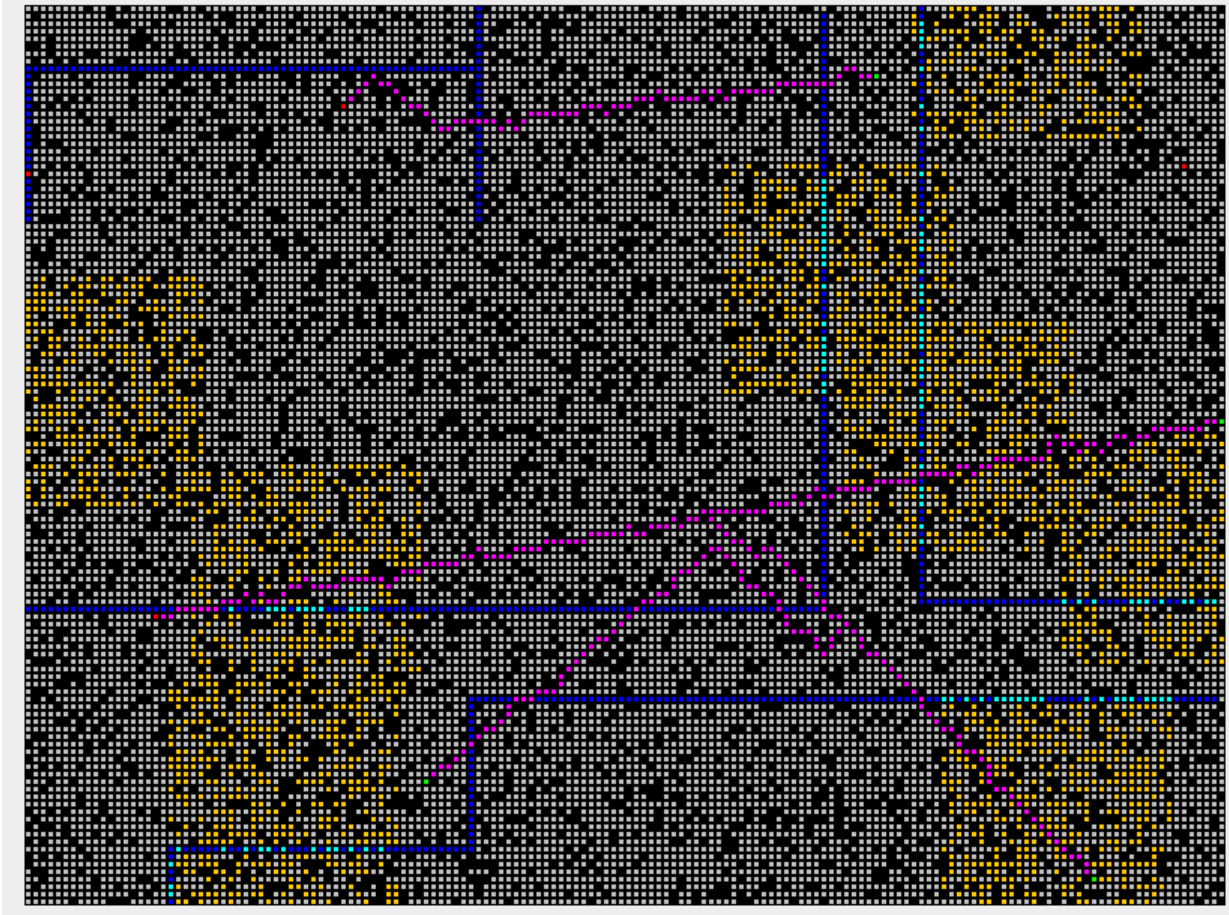
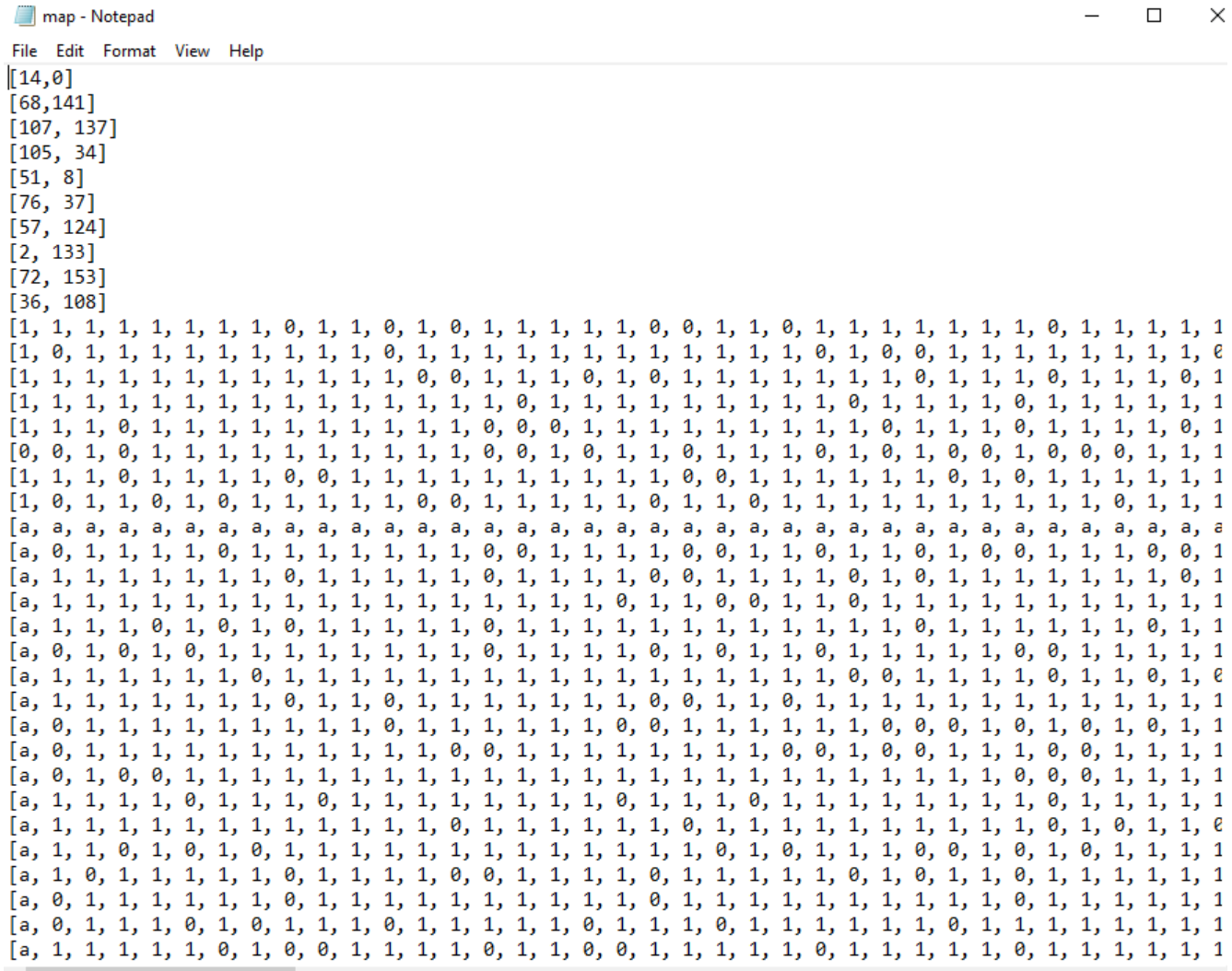
Nick Lelchitsky

Assignment 3

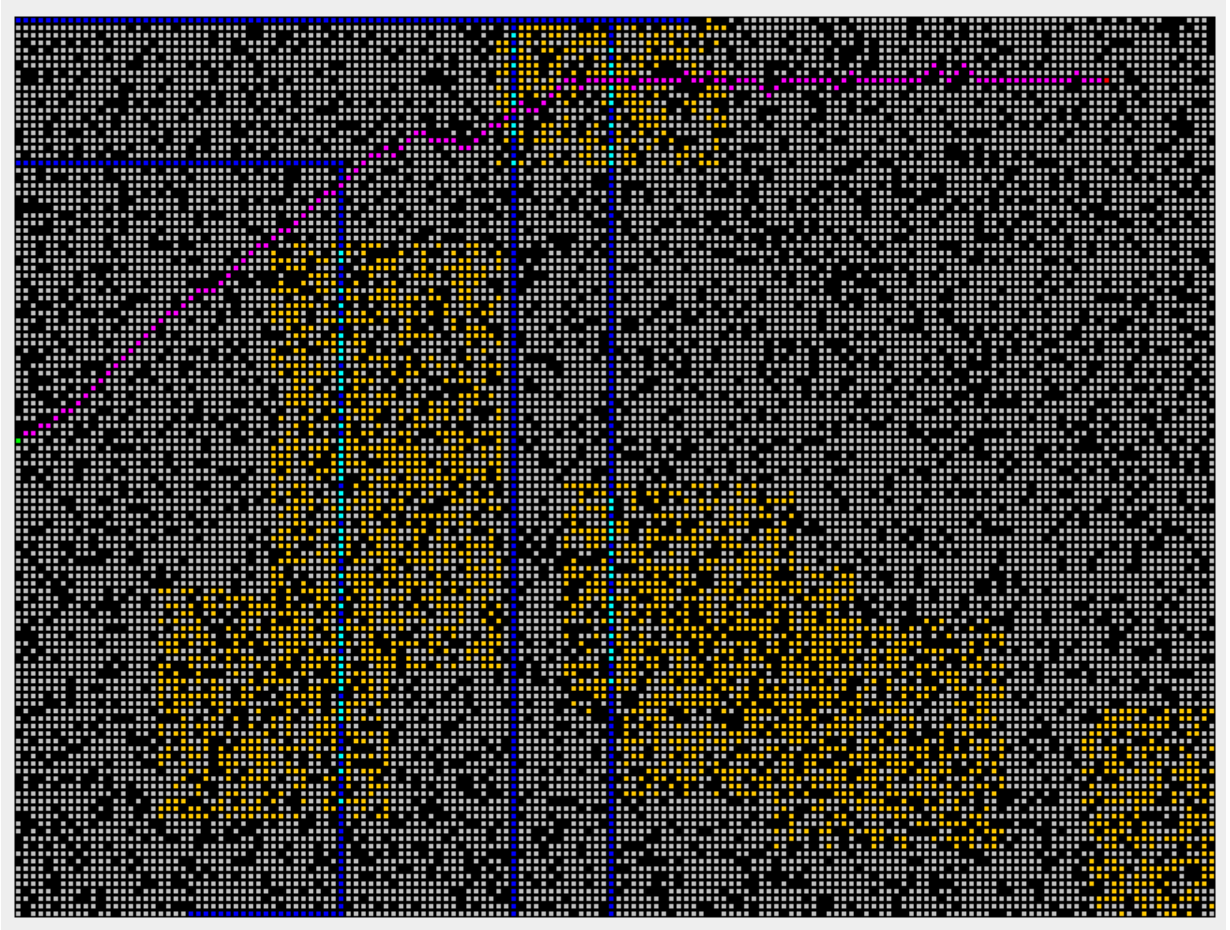
a)



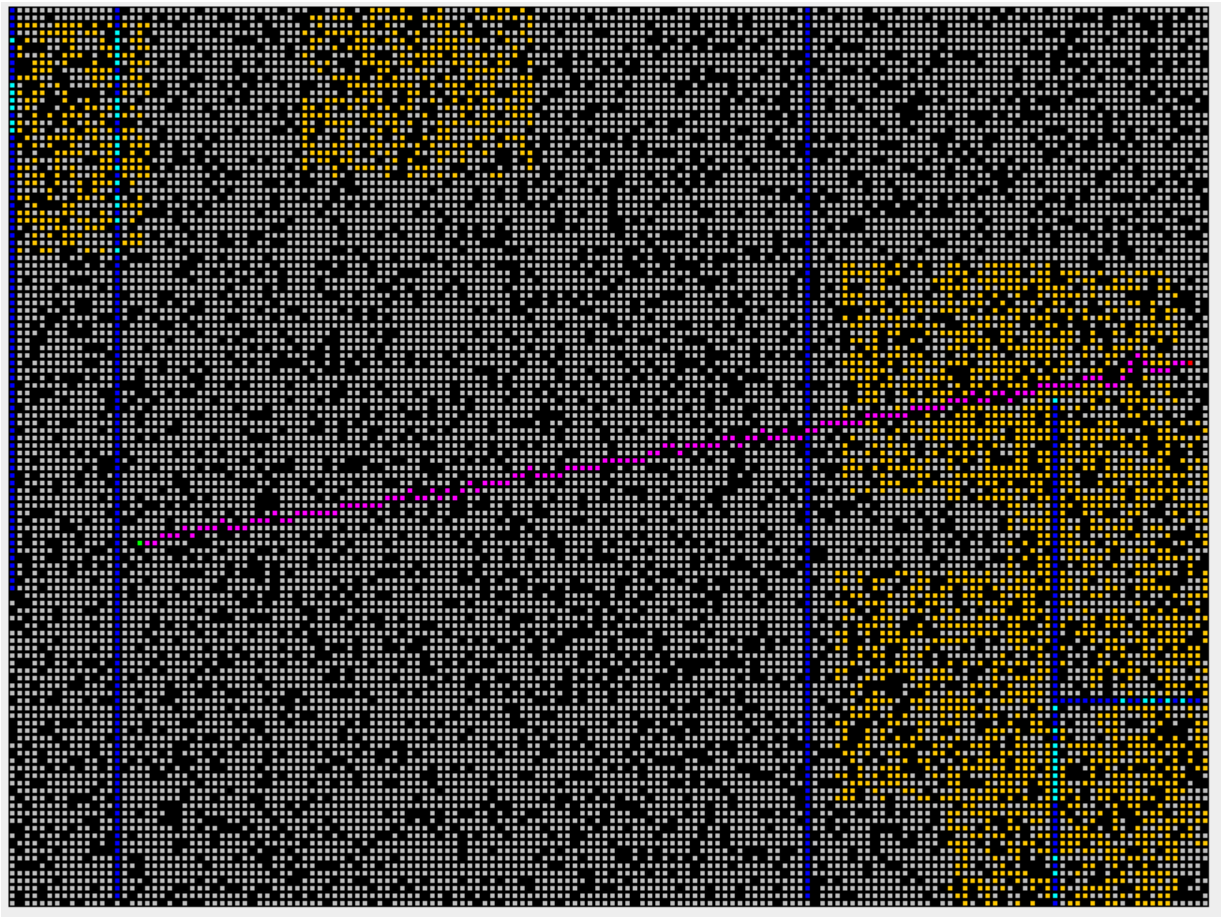




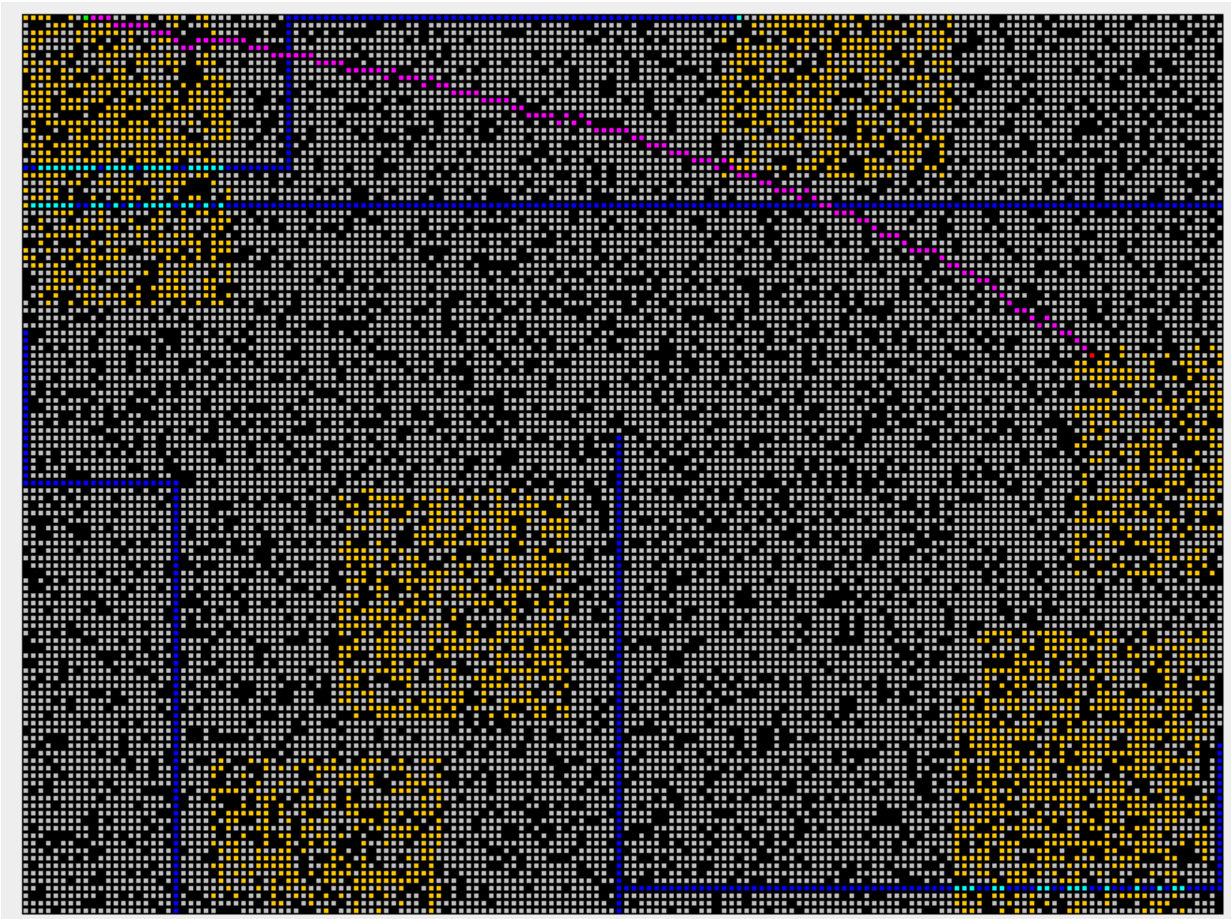
b)
Uniform cost w = 0



A* w = 1



Weighted A* w = 2

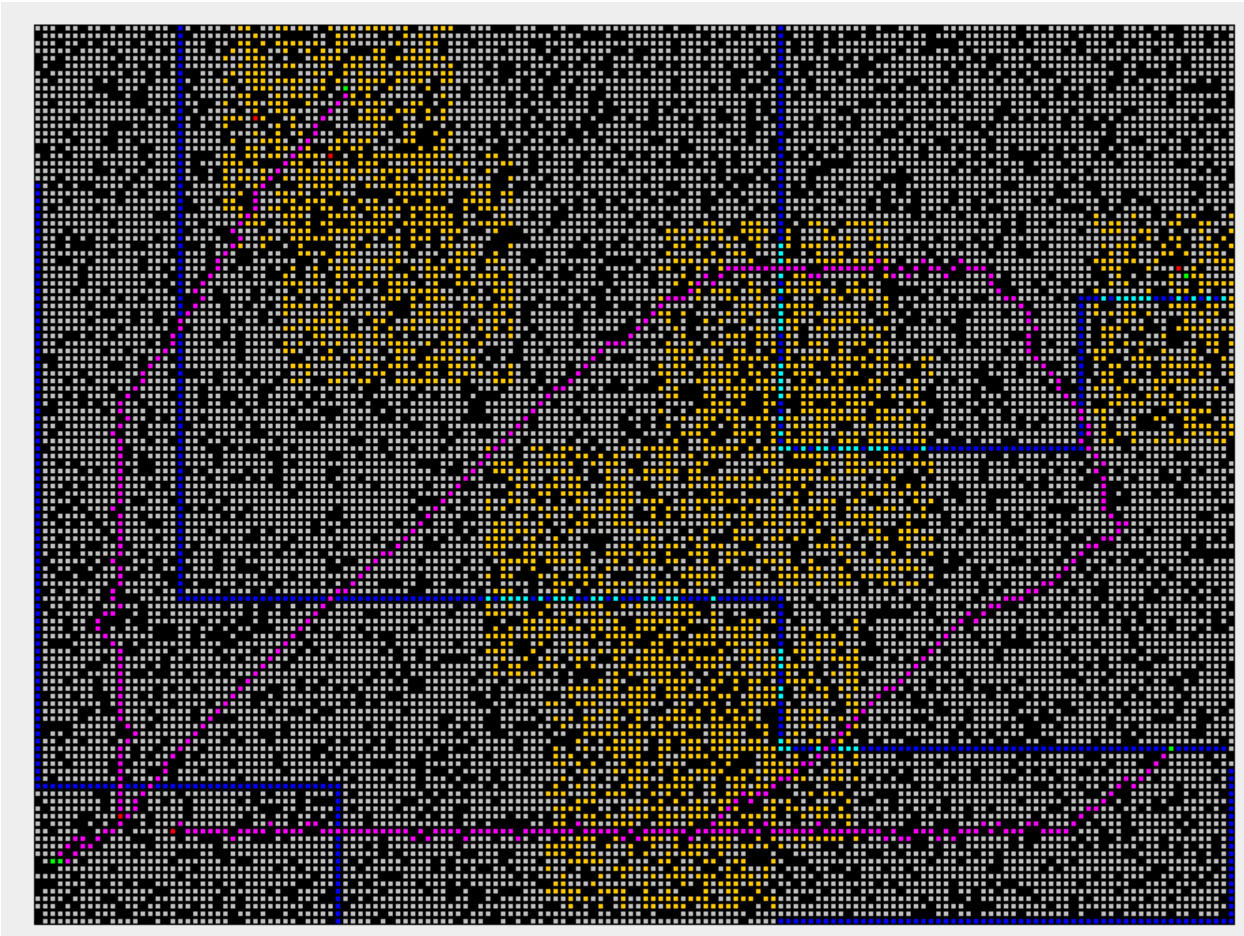


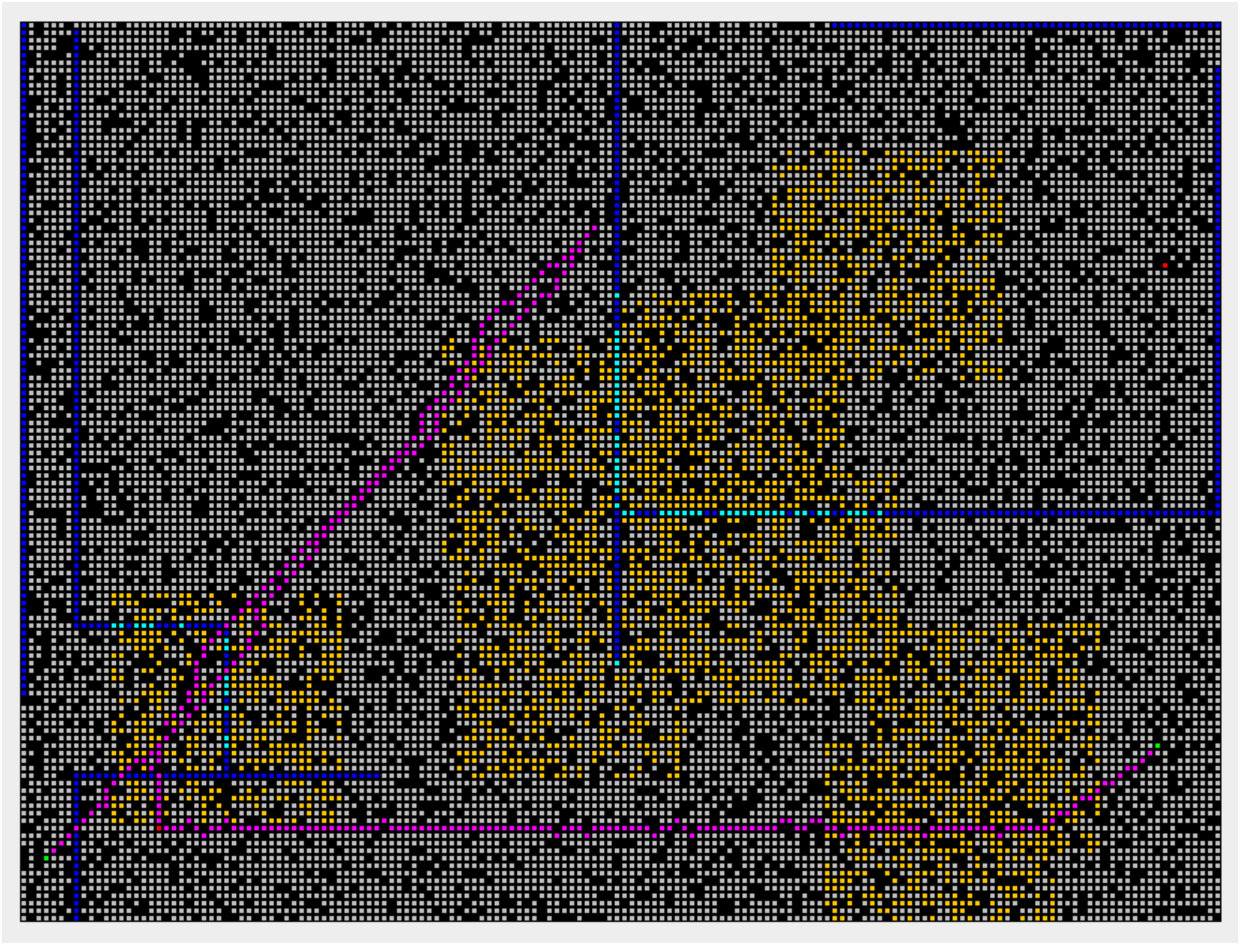
c) Uniform cost optimized by not calculating heuristic

d) Best heuristic: h(s) = log(distance(h,g)):

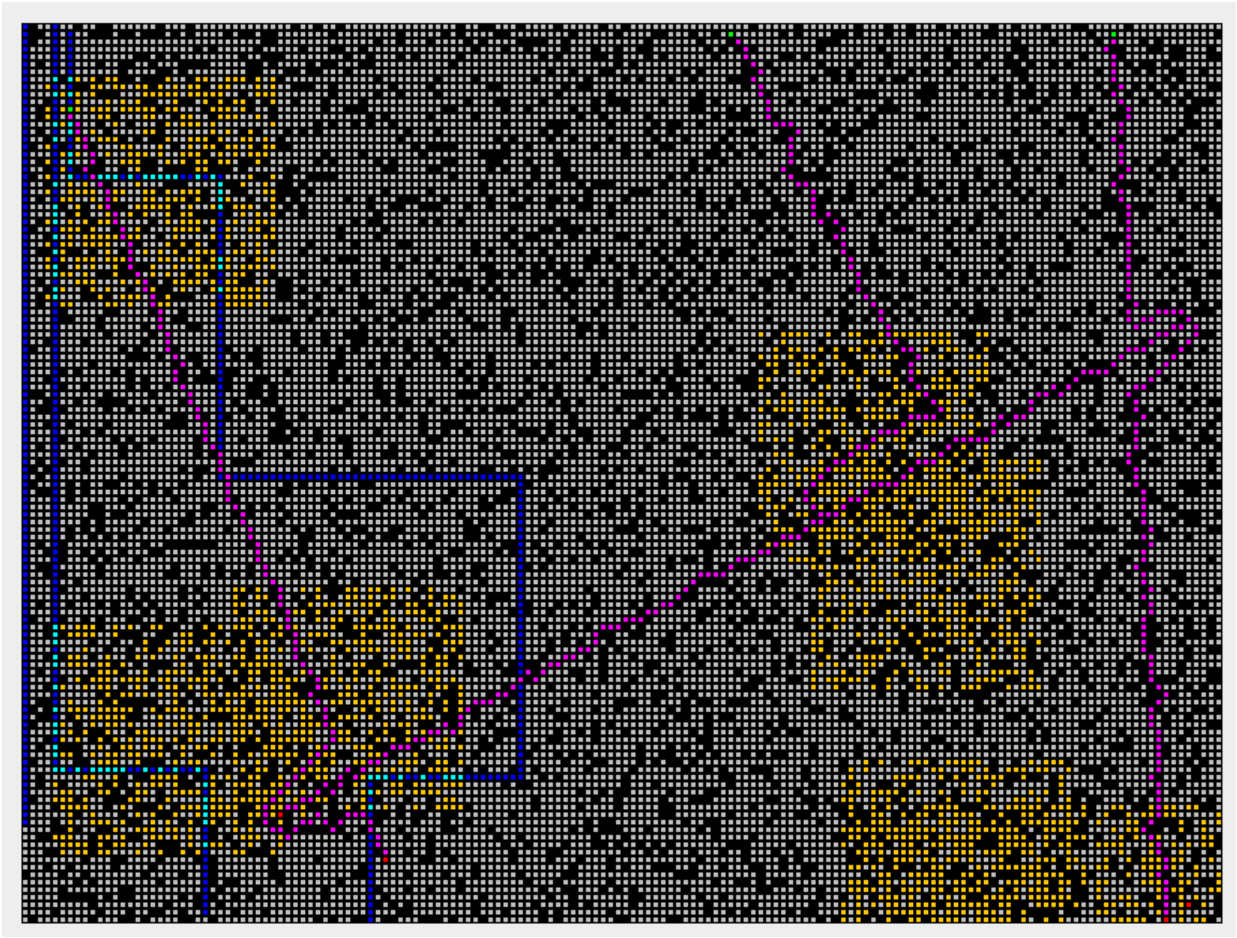
others: h(s)= distance(h,g)ˆ2 : very slow

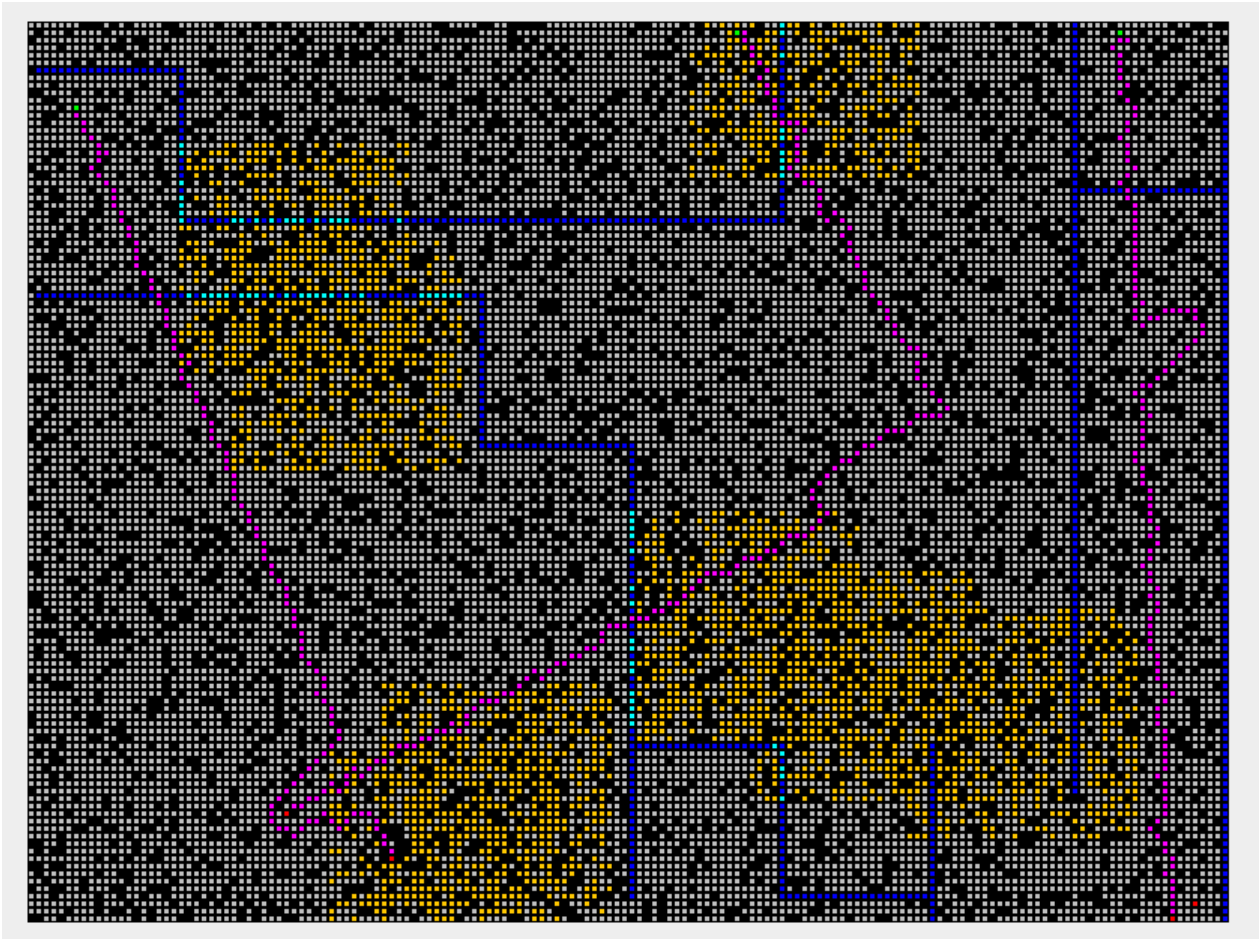
e)
Uniform cost: average time: 2s average expansion:path ratio: 6.5 nodes expanded: 10210



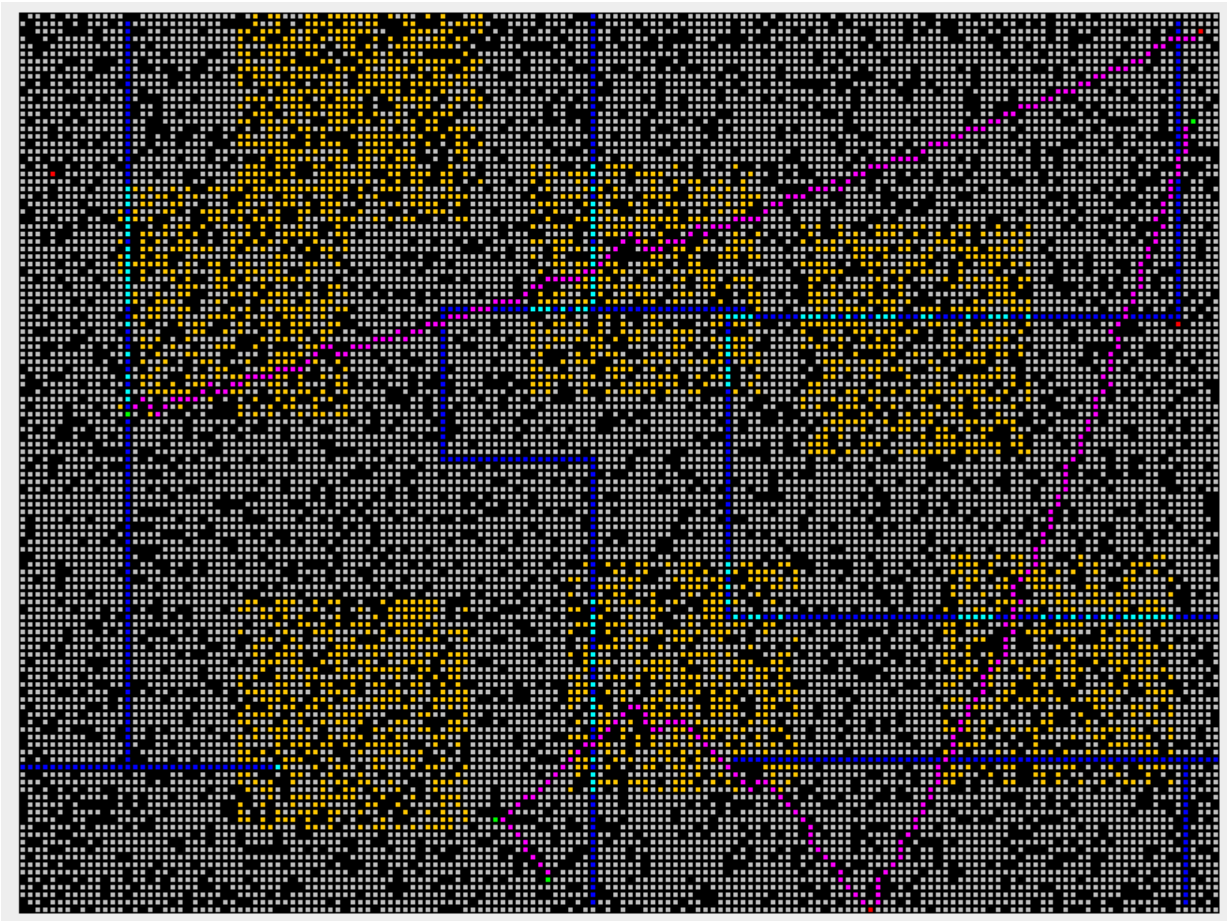


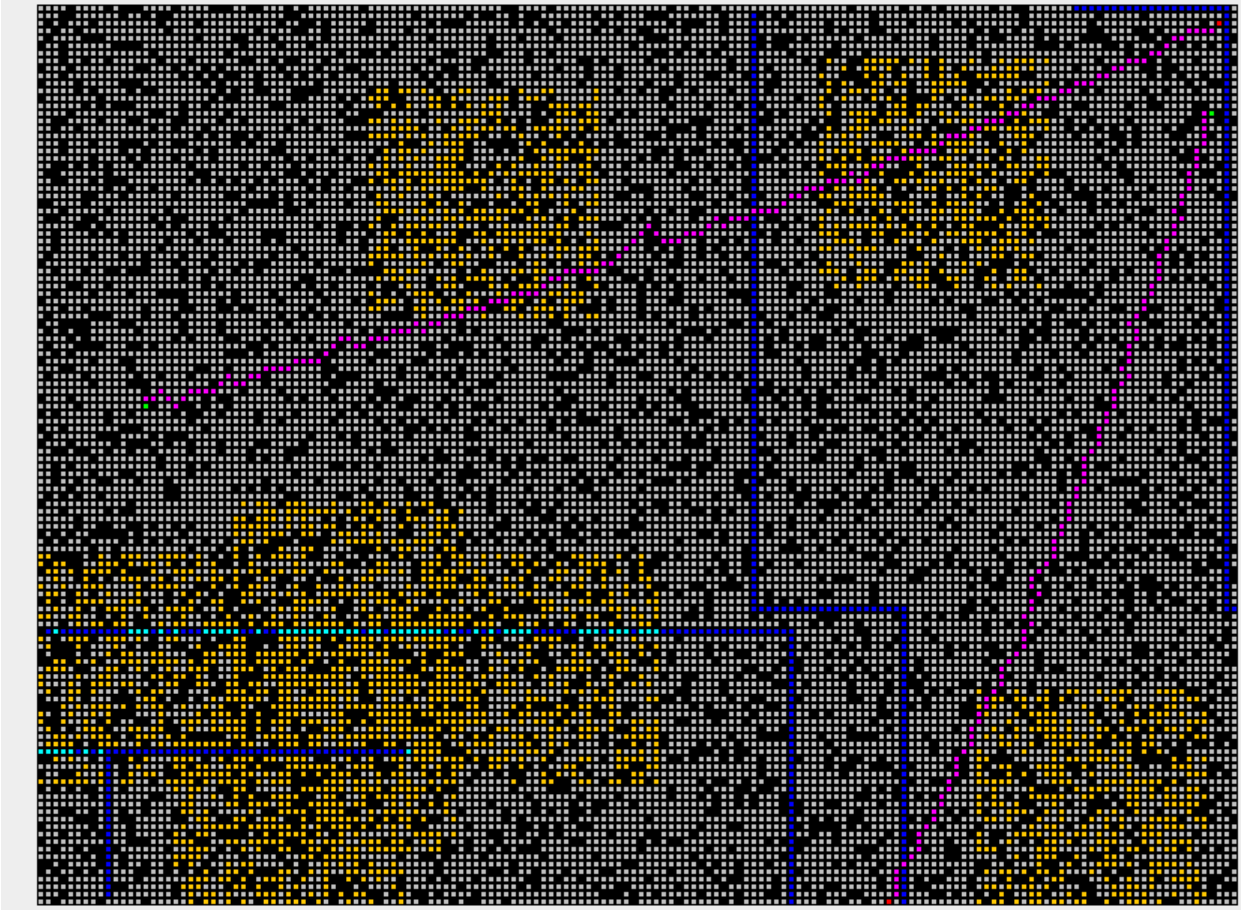
A*: average time: .111s average expansion:path ratio: 5 nodes expanded: 527



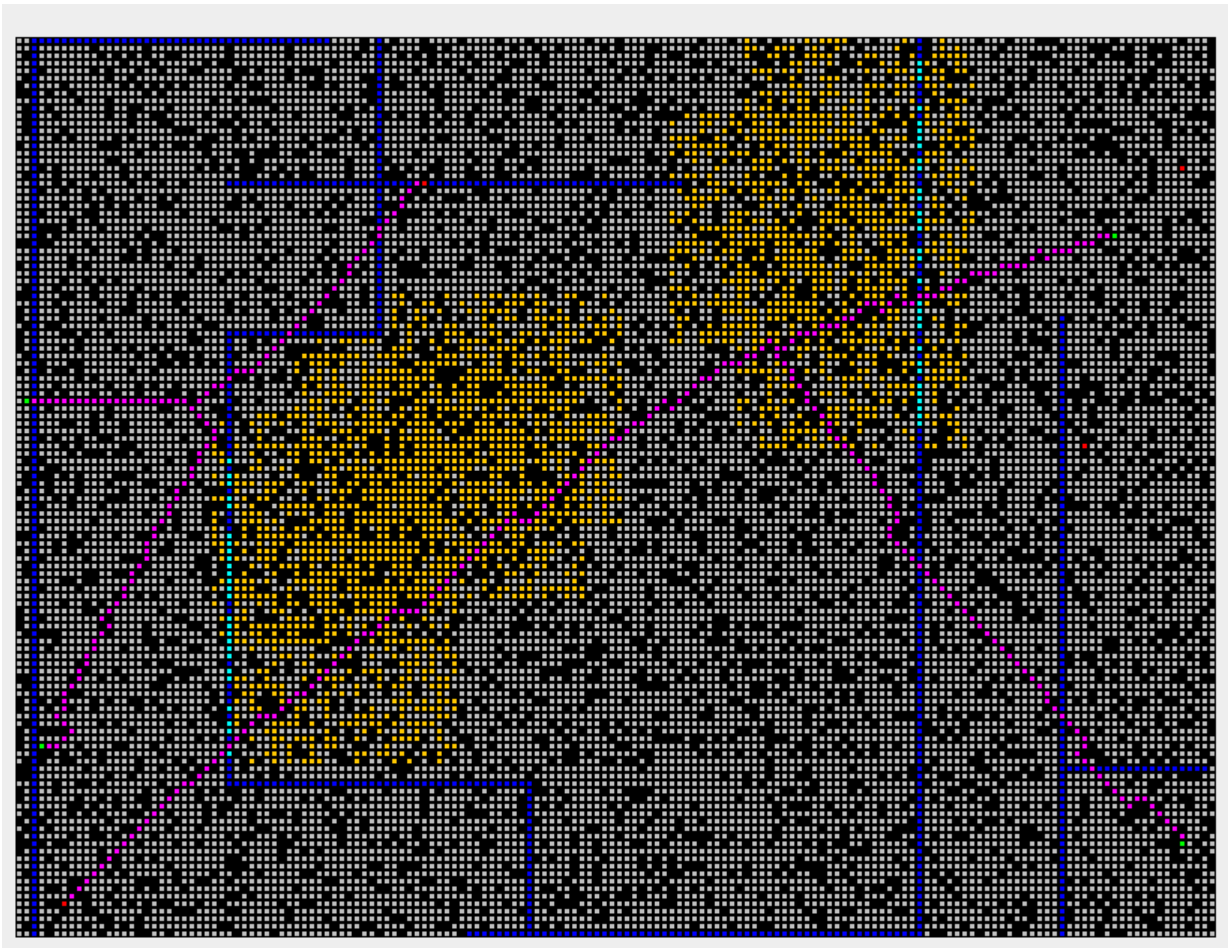


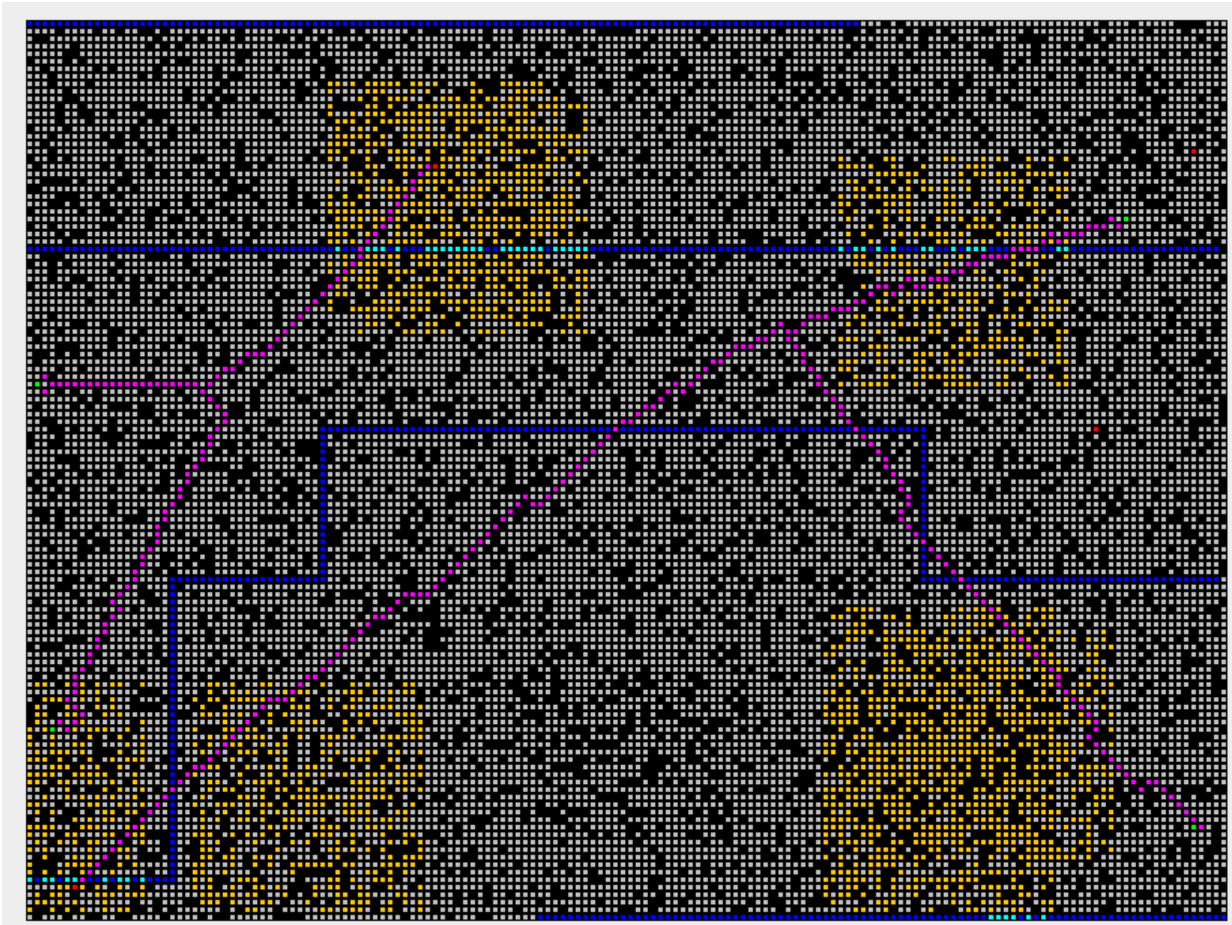
Weighted A*: w = 1.25 average time: .01s average expansion:path ratio: 6 nodes expanded: 156





w = 2 average time: .004s average expansion:path ratio: 6 nodes expanded: 468





f) The trend was that the higher the heuristic, the faster the algorithm. As we can see a weight of 2 over 1.25 yielded almost double the speed. The ratio of nodes expanded compared to the length of the path stayed the same while the number of nodes tended to stay about the same, with an advantage going to weight between 1 and 2. The performance gain with higher weights plateued after 2 and started to decrease at around w=5. Therefore weighted A* was faster than A* which was much faster than uniform cost. The heuristic provided a fair estimation in regular A* while increasing slightly tended to higher average speed but with more inconsistency. In this case, putting more weight on the straight line distance to the goal is more effective since there aren't many obstacles to avoid.

g) Sequential search not implemented