Intro to AI Project 1

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1 Part 1

1.1 a.

The agent will move toward the cell with the lowest f-value. The f-value is determined from the sum of the cost from the start, or g-value, and the heuristic value to the goal, or h-value. For the first move, each possible direction is one tile away from the start, meaning that the g-value for each move will be the same, and differences in the h-value will be the deciding factor on where to move. Since the agent does not know that cells D3 and E4 are blocked, it will move to the east, the direction that leads to the cell with the lowest h-value and therefore the lowest f-value.

1.2 b.

The agent will continue to act as long as the open list remains populated. The open list is created from cells adjacent to expanded cells. This means that any cells that is adjacent to a reachable cell will be expanded eventually, until the target is reached. Therefore, if an unblocked path from the start state to the end state exists, the agent will eventually find it, even if it has to expand every possible cell. The grid worlds are finite in size and so there is a finite number of cells that will be added to be expanded. Expansion can be done in a finite amount of time and traversal can be done in a finite amount of time. Considering both processes can be done in finite time and there are only finite cells to iterate over, in the scenario given a path can be found in finite time.

2 Part 2

We observed that tiebreaking had little to no effect on the performance of the Repeated Forward A* search. While using g to tiebreak would likely be useful for performance on an empty map, the amount of obstacles in the way means that there is relatively little gain with g.

3 Part 3

The Repeated Forward A* search and Repeated Backward A* search were both able to find possible solutions where solutions existed, but their exact paths differed in some cases. This is likely because that although they solved the same maze, each one had different information available to them as they could only see cells near them. As such, their differing starting locations led them down different paths. Neither method's path was consistently superior to that of the other.

4 Part 4

5 Part 5

6 Part 6

Changing the method of visualizing the path of the agent would likely yield the greatest reduction in memory consumption.
(1,001 x 1,001) = 1002001 cells
At 2 bits per cell:
2 * 1002001 = 2,004,002 bits 250 kB

4MB = 32000000 bits
At 2 bits per cell:
16000000 cells possible
grid size = sqrt(16000000) = 4000 x 4000 grid