

A2 – CS4300 Assignment A2 Lab Report

Wumpus World

By Yucheng Yang
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1.Introduction

Create two agent functions for this assignment. The first agent function CS4300_agent_Astar is randomly moving to find a path to gold, then back to the start place. The algorithm to find out the back path is A*. The second agent function CS4300_agent_Astar_AC finds a relatively safe path to get the gold, then back to the start place. The method to find a relatively safe path is AC3 which will narrow down the domain of each grid in the board. The algorithm to find a way back is also A*.

- What are the inner constraints of the grid in the board?
- Is this true that using AC3 improves the survival possible under all kinds of boards?
- Is this true that using AC3 improves the cost of getting gold under all kinds of boards?

2.Method

The first agent function-CS4300_agent_Astar, before getting the gold, the agent takes random actions which may cause death or not. After arriving the Gold grid, the agent calls A* method to find out the shortest path back to the start grid. The A* will take a partial board which is the grids that agent passed during finding gold. This partial board guarantees the safety of agent.

The second agent function-CS4300_agent_Astar_AC, before getting the gold, the agent takes the actions based on the AC3 algorithm. The AC3 algorithm using the inner constraints of the grid in the board to narrow down the domain of each grid in order to pick a safer action. It still has the chance to make an action which makes the agent die. And it has higher possibility to provide a shorter cost to find the gold then first agent. After arriving the Gold grid, the agent also calls A* to back to the start place.

Here is some steps in CS4300_agent_Astar :

1. Take randomly action.
- 2.Record the grid that agent passes.
3. If find the gold grid, call CS4300_Wumpus_A_star based on the passed grids to get the solution.
4. Take action based on the solution to back the start place.

Here is some steps in CS4300_agent_Astar:

1. Initial the G table (the neighbor table of each grid 16*16), the D table(each grid's domain 16*3). the domain of grid represents {C, P, B}.
2. After any action, based on percept, reset the domain of currency grid, then Call

CS4300_AC3 to revise the D table.

3. Based on the percept and D table to chosen a grid that doesnot pass before and has a solution to arrive.

4. Call the CS4300_wumpus_A_star to let the agent move to the chosen grid which may be safer.

5. If find gold grid, call CS4300_Wumpus_A_star based on the passed grids to get the solution.

6. Take action based on the solution to back the start place.

Some details in the functions. The CS4300_wumpus_A_star will return a solution and a nodes. The nodes is a tree table, helping the sorting method to find the shorting way to back. We always pick the frontier of the tree to find out which node we want to explore. Nodes in this function has $C = g + h$. g is the cost that it already spends. H is a value I predict. In the homework the h is the sum of absolute value of differenc on x- axis and y-axis.

Label sets are details about CS4300_AC3. In this homework, each grid have 3 label {C, P, B}. C is clear, P is pit, B is breeze. If there is a grid has a pit- grid in the neibohood, then this grid has to be a breeze label. If there is a clear grid, then there is no pit-grid in its neibohood.

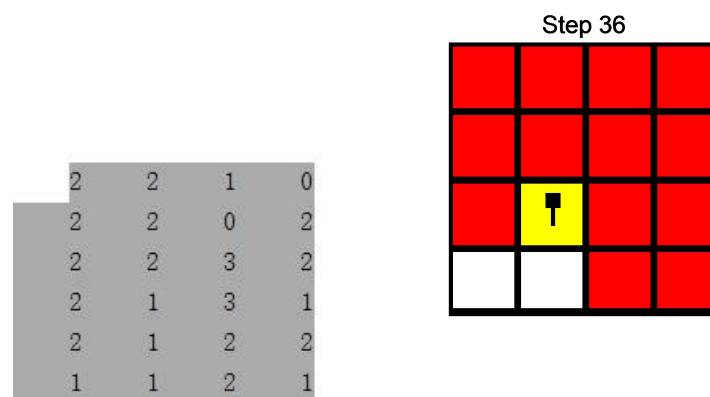
In this report will use plot to show the performance of two kinds of agent function based on mean value, suvival rate, variance.

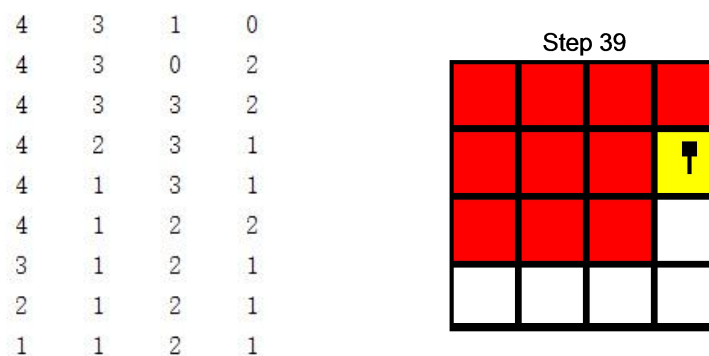
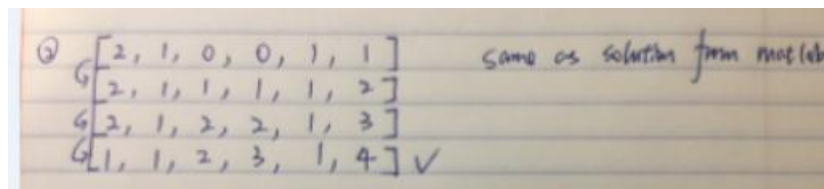
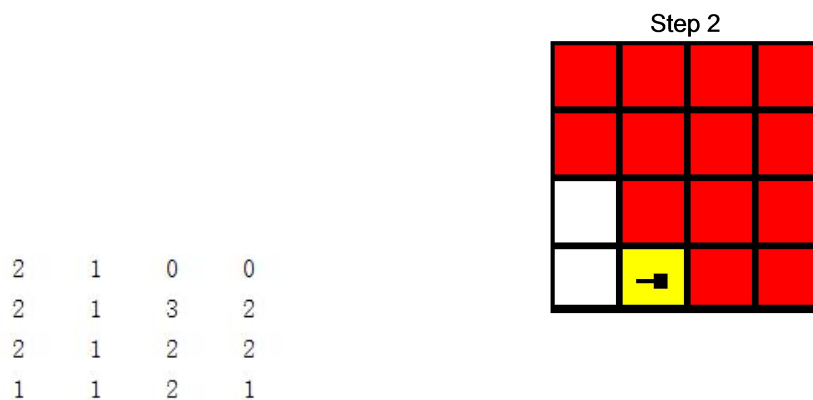
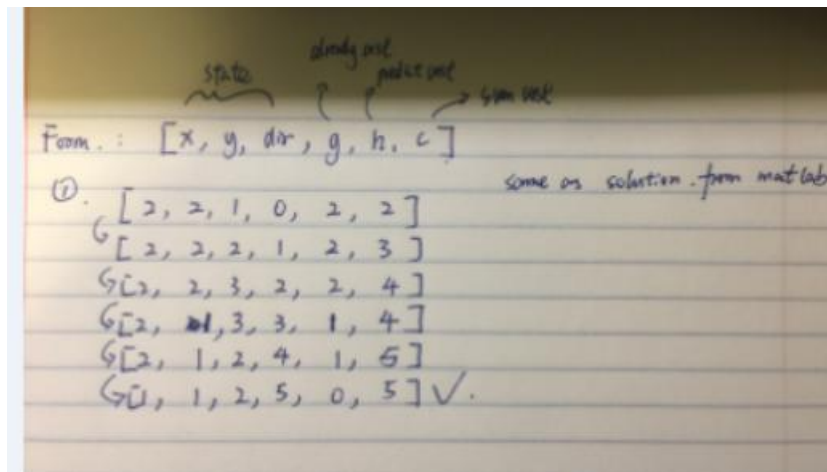
3.Verification of Program

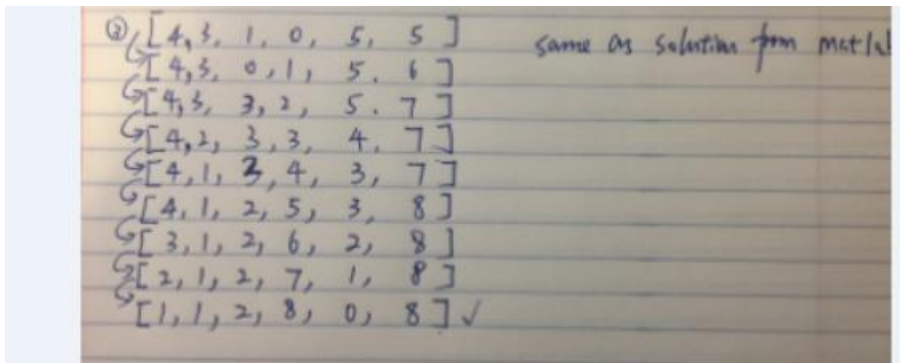
First.prove the A* algorithm well performed as expected.

Here is the table, red grid means the agent never went to this grid. The White grid is the grid that agent passed.

The left picture is the solution from the function A* in Matlab.

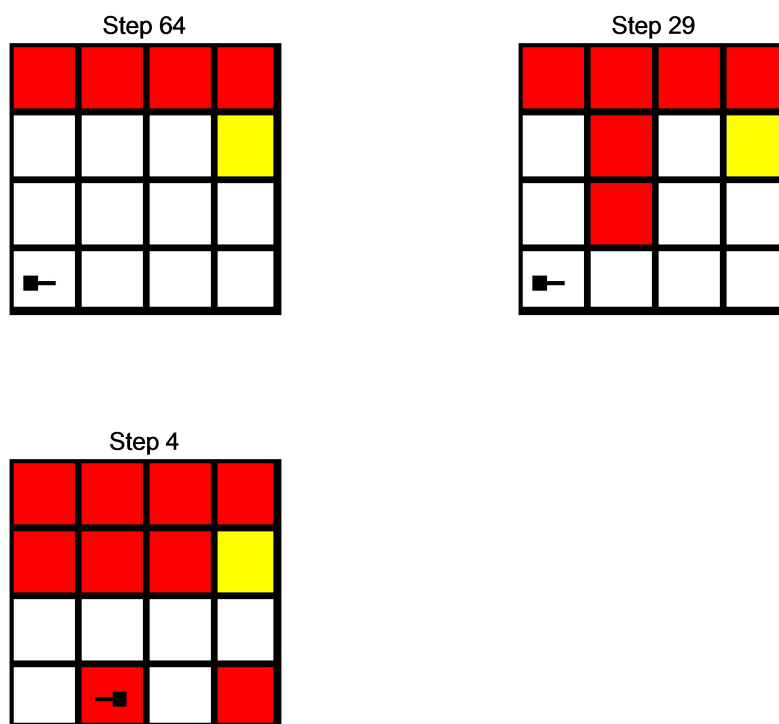




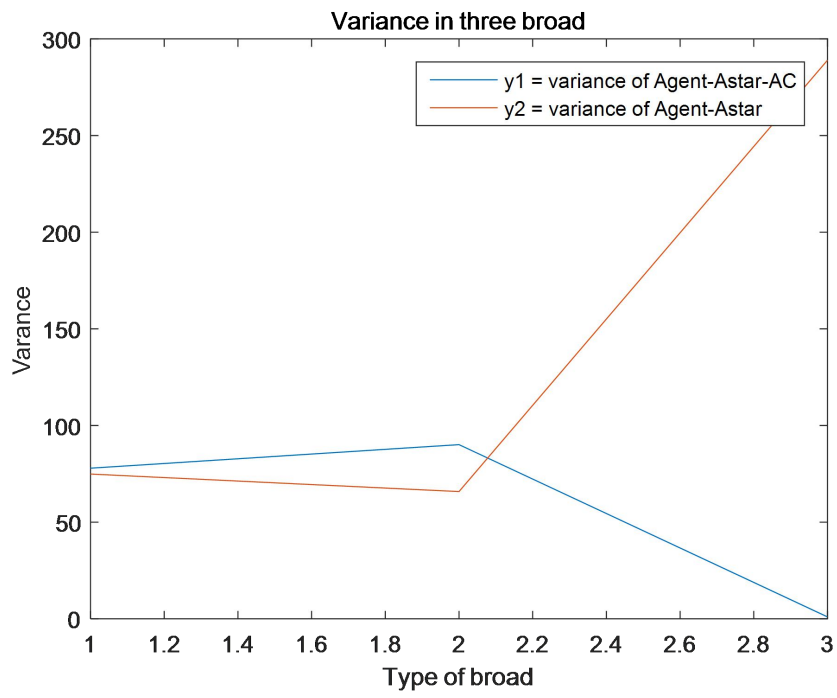
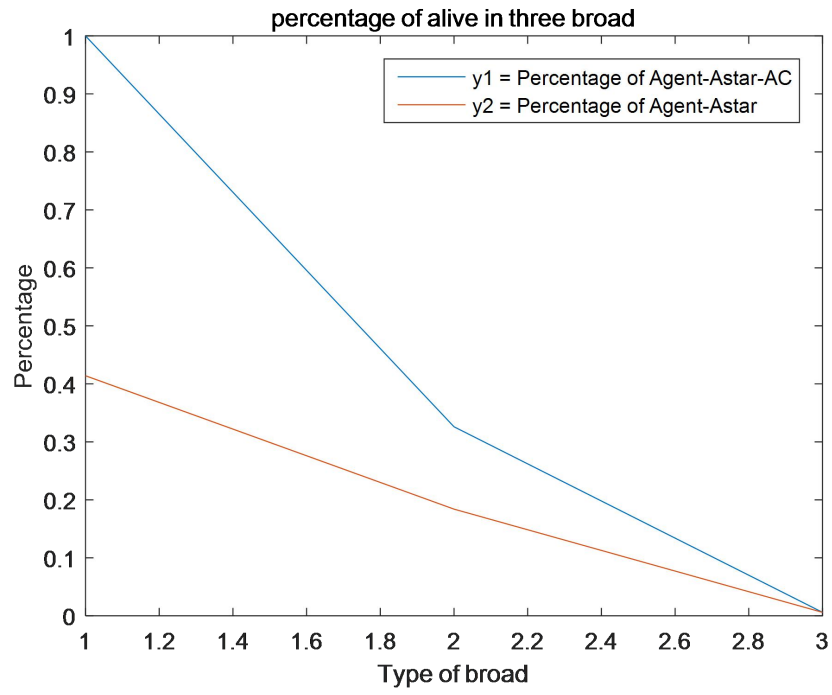


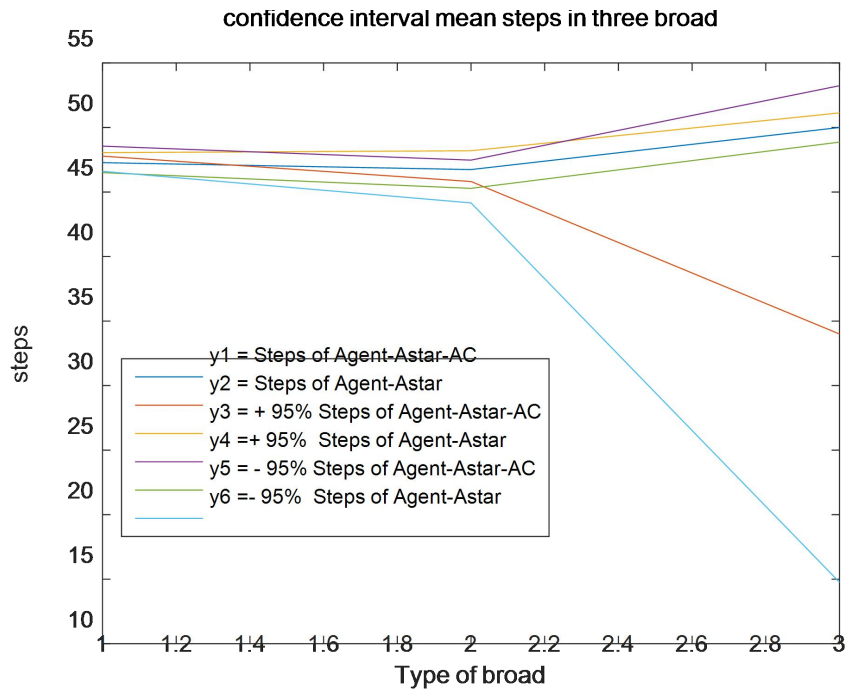
From the hand write result and the solution provided by function A*, they are all same. So the function A* will output a shortest solution to lead the agent back to the start place.

4.Data and Analysis



the first one is board 1 which has less pits, the bottom one is board 3 which has most pits in the table.





5. Interpretation

The reason in board1 and board 2, CS4300_agent_Astar_AC has an obvious high survival rate is it will keep finding the save grid that does not pass, and when the agent is in the grid of breeze, it will back and search another reachable save grid, but CS4300_agent_Astar will randomly die.

I did not pick the save grid by the index order in D table but randomly choose the grid then find whether this grid is a reachable safe grid. And if the agent sits in the breeze grid, the function will randomly search the grid that is not the neighborhood of this node. Therefore, the variance of AC is stable.

The reason for the survival rate in board 3 is that almost all grids that do not pit are a breeze. CS4300_agent_Astar_AC actually randomly actions when all the grids it passed are the breeze. In this case, it will run the same way as CS4300_agent_Astar.

6. Critique

As my computer is not fast enough, I only take 200 times run each broad, the data may affect by some noisy data.

As AC3 is limited in making a best idea, it can only choose one of grid that is not passed, but which grid passed first may cause big different. If searching the grid in the order of index in D table, it will cause the agent always run the same way as last several times which may waste a lot of steps to find gold.

7. Log

10 hours on the Matlab.
8 hours on writing report.