CS 171 Wumpus World Final AI Report

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I. In about 1/2 page of text, describe what you did to make your Final AI agent "smart."

Overall, our Final AI agent is one that makes careful decisions based on the percepts it receives for the current position instead of taking risks. It is able to identify the next valid moves by taking into consideration its visit history, the cave's dimensions, as well as the location of the Wumpus. Specifically, the agent remembers the cells in which it has already visited to ensure that there are no duplicate visits. It also remembers the safe path it has taken to be backtracked upon whenever it reaches a cell that is considered risky or that has no valid moves available. It is able to backtrack step by step and explore the unvisited cells to maximize its chances of finding the gold, and only gives up and climbs out of the cave once all cells that are considered safe has been visited. The types of cell that the AI agent deems as risky are those with the Breeze and/or Stench conditions set to true, although the actions it takes differ for each condition. When encountering a Breeze cell, the agent simply backtracks to the previous cell and resumes its exploration of other unvisited cells, as it does not want to risk moving forward and possibly falling into a Pit. However, when the agent arrives at a Stench cell, it would go through a series of condition checking. If it is the first stench it encounters, it would simply backtrack to the last safe cell. If the agent encounters more than one stench, it would then go through a series of logic to figure out the location of Wumpus. It only shoots the arrow towards the Wumpus cell when that cell is the only available valid move. This reduces our chance of shooting arrow blindly, which would result in -10 in score. When the gold is finally found, there is no point of exploring any further. That is why the agent will find the shortest path from where it is currently at to the cave's entrance to climb out, rather than backtracking through every single cell within the path that it has already taken. With a good memory, a careful personality, and fair deduction skills, our Final AI agent is "smart" in this sense.

II. In about 1/4 page of text, describe problems you encountered and how you solved them.

Due to the fact that the dimensions of the worlds are unknown to the agent, it makes it difficult to have a fully observable environment with known coordinates for the agent to operate on. Therefore, our team began with storing the actions that the agent has taken so far. If it encounters any Breeze or Stench, the agent simply executes the reversed of the last action taken to backtrack. Although this method seemed to work for the Minimal AI, we realized that it was incredibly inefficient and limited for the future development. If we simply store the actions, it is nearly impossible for the agent to calculate its neighbor cells and choose next valid move. We reinvented the entire project with a coordinates-oriented approach. The program would calculate and store all coordinates that the agent has visited and the path that is completely safe (no Breeze or Stench). As it turned out, the unknown world size still makes it problematic to determine the bounds, which initially caused the agent to be stuck in an infinite loop. It was due to the agent assuming the world is infinitely big and keep trying to move beyond the bounds even when it hits a bump. This problem is solved by recording the direction of the bump, preventing the agent from moving towards it, and exploring other unvisited cells.

III. In about 1/4 page of text, provide suggestions for improving this project.

One suggestion for improving this project is to incorporate the paths to the source and destination within shell scripts for students to quickly test their AI's. It was extremely repetitive and time-consuming every time when we had to run the test program because we would have to type out the entire path to the folder or the file that we want our AI to run on it. We found that creating shell scripts that can automatically move to the appropriate folder to execute specific commands makes our debugging process much faster and saves a lot of time for us. Another suggestion is to improve the game's console UI. Our experience with it has been time-consuming as we had difficulties in understanding how to maneuver the agent around the world by considering the direction it faces as well as the various commands offered within the options.