CS-171 Wumpus World Final AI Report

Team name   DankMemes

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

To start off, we instantiated a Board class that holds the state of the board, along with individual Square classes in each square of the board that holds a score value based on varying probabilities that decides attractiveness to the AI. These are calculated based on values such as probability of a Wumpus, pit, and whether or not it is visited or empty. At the beginning, we either exit immediately when perceiving a breeze, or shoot in the forward direction if perceiving a stench. If we hear a scream, we know the Wumpus is dead and otherwise, we know the exact location of where it is. At every step, when our AI is deciding where to go next, it first updates the probabilities of adjacent squares based on the percept. For example, if a square has been sensed to potentially have a Wumpus or pit, we subtract points for each time we detect it, and add points if we perceive nothing, as this implies the square is perceived to be empty. Squares are also awarded points if they are unvisited.

Next, it checks through all possible moves and chooses to move towards the square with the highest point value. When calculating the scores of adjacent squares, we also looped through the adjacent squares of each of those squares (one level deeper), awarding more points to squares that may lead to more potential open routes, and subtracting points to routes that will lead to dead ends caused by perceived Wumpus' or Pits'. Ultimately, this ends up in a depth first search algorithm that has our AI searching paths until it perceives a stench or breeze, then backtracks accordingly.

Throughout the AI's journey, it also utilizes a couple optimization techniques which we have fine-tuned to result in higher score values. Depending on the number of visited new squares, we set a cap to the number of times our AI will repeatedly visit a square before deciding to backtrack and climb out. This prevents getting trapped in infinite loops. Our AI will also shoot at a square if we have perceived a potential Wumpus in it twice.

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

A major issue that we encountered during the beginning stages of our project was the challenge of incrementally testing our changes. Testing the validity of our custom classes and score system was almost impossible until we completed our debugging helper functions and got our agent successfully navigating the board on its own. We often made changes that we *thought* worked but actually didn't. This led to a lot of stress and backtracking further down the road. We solved the problem by *carefully* working through every bug and pushing past the tough initial start stages. Once we had a functioning AI, incremental testing was much easier. Another major problem was trying to get our AI to score comfortably over 200. We were stuck between 200 and 210 for several days, despite adding numerous optimizations. To solve this issue, we generated a large amount of 7x7 worlds and watched our agent navigate the board. Every time we saw the agent make a sub-optimal decision, we broke it down and figured out why it was acting that way. Then we wrote code to ensure that similar sub-optimal decisions were never made again. That was able to bring us to a comfortable average score of 220.

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

Improvements we'd make to out project would be to use a more optimal search strategy. Although we implemented a depth first search type of navigation system, we would've liked to use A* search. The only issue was that we couldn't think of a valid heuristic function to estimate our distance from the gold. To improve the course project assignment as a whole, we'd suggest talking about the project logic and relevance to course lecture material more often. We really enjoyed the few lectures where you discussed specific wumpus world examples and talked about how it related to the lecture material. But there weren't as many as we would've liked.