Wumpus World Final AI Report

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I. Minimal AI
I.A. Briefly describe your Minimal AI algorithm:
1. The most important, each time reach an unvisited position, if "Glitter" then do "Grab", and setPathTo (origin).
2. Maintain 3 2D-matrixes maybeMonster/ maybePit/ isSafe to indicate whether the position (i,j) is maybe a Wumpus/ maybe a pit/ surely safe. Update these matrixes after receiving any perception. At the very beginning, for all position except the origin, maybeMonster is true, maybePit is true, isSafe is false.
3. Maintain an Action-Queue. For each request, if the queue is not empty, pop and return the top element. If the queue is empty, we search for next action.
4. We mainly implement setPathNew(). In this function we do BFS from current position to find the nearest (in fact, not taking "TurnAction" into consideration yet, just search for the nearest position in space, not the one with the minimum cost), reachable (through visited safe positions), unvisited, safe position. If we found such a position, we put the action sequence into Action-Queue.
5. If no such a position, which means we have visited all the surely-safe position, we decide go back to origin point. We also implement setPathToPos(targetPos) which find the nearest way to targetPos (implementation is similar to setPathNew()). We use setPathToPos() back to origin point and climb out.

I.B. Describe your Minimal AI algorithm's performance:

minimal/draft AI					
Cave Size	Sample size	Mean Score	Standard Deviation	99% Confidence Interval_min	99% Confidence Interval_max
4x4	10000	271.356	445.595	-876.49672	1419.20872
5x5	10000	228.707	423.898	-863.254248	1320.668248
6x6	10000	180.096	393.344	-833.158144	1193.350144
7x7	10000	149.934	369.97	-803.10872	1102.97672
Total Summary	40000	207.52325	408.20175	-844.004458	1259.050958

II. Draft AI

II.A. Briefly describe your Draft AI algorithm, focusing mainly on the changes since Minimal AI:
Same as minimal version.

II.B. Describe your Draft AI algorithm's performance:
Same as minimal version.

III. Final AI

III.A. Briefly describe your Final AI algorithm, focusing mainly on the changes since Draft AI:

1. For the function setPathNew() and setPathToPos(targetPos), take "Turn Action" considered, that is, not the nearest in space but the minimum cost.
2. Take "Shooting" into consideration. When setPathNew() couldn't find an unvisited, safe position, and matrix maybeMonster[][] indicated only one possible Wumpus position, then setPathToPos to the nearest Wumpus-adjacent position, and then shoot. Then continue our exploration.

III.B. Describe your Final AI algorithm's performance:

FinalAI					
Cave Size	Sample size	Mean Score	Standard Deviation	99% Confidence Interval_min	99% Confidence Interval_max
4x4	10000	298.915	458.099	-881.148024	1478.978024
5x5	10000	245.776	434.482	-873.449632	1365.001632
6x6	10000	190.192	401.534	-844.159584	1224.543584
7x7	10000	157.356	377.111	-814.081936	1128.793936
Total Summary	40000	223.05975	417.8065	-853.209794	1299.329294

IV. In about 1/4 page of text or less, provide suggestions for improving this project.
1. In our AI, we decide to go to the nearest (minimum cost) reachable safe unvisited position. This is a simple choice. Maybe try to design a shortest path to go over all safe unvisited positions is a better choice.
2. When we did not get gold and all safe positions visited, if we are sure where the Wumpus is, we decide to go shooting Wumpus. Maybe there's a better timing selection, such as "When visited more than half positions of the whole map but no gold found, then go to shoot Wumpus". But this timing design seems tricky? We did not go deep on it.