Project 2: Multi-Agent Pacman Charlie Barber u0980833
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Multi-Agent Pacman

Reflex Agent

What was the feature you used for your evaluation function?

I took the reciprocal of the closest food and capsule so that a larger distance has a smaller positive effect on the choice. I also added the reciprocal of the closest ghost because I don't want the Pacman to always run away from the ghosts. I also made a function that would never have Pacman go towards a ghost if it results in him being next to it because that is too risky. Lastly, I added the current game score to the linear function in hopes of preventing Pacman from standing still where there is a pellet next to him.

Minimax

When Pacman believes that his death is unavoidable, he will try to end the game as soon as possible because of the constant penalty for living. Give an explanation as to why the Pacman rushes to the closest ghost in this case?
He rushes towards the ghost, because he wants to maximize his score as he is the max agent. And since he knows he is going to die, as he knows where the ghosts positions are, rather than wait to die and his score going down, he charges the ghost to keep his score as high as possible.

Expectimax

You should find that your ExpectimaxAgent wins about half the time, while your AlphaBetaAgent always loses. Explain why the behavior here differs from the minimax case.
The AlphaBeta Agent prunes away branches that could possibly be important in some cases whereas minimax searches all possible branches. This leads to the AlphaBeta agent to possibly not always picking the best state to be in at a given time.

Evaluation Function

What features did you use for your new evaluation function?

I basically punched in different numbers until something worked while keeping the idea that I want Pacman to go after food pellets, which is why I used a small decimal to multiple the closest food's distance. Similar to the previous evaluation function, I used the game score in hopes of preventing Pacman from staying still when there is a food pellet next to him. The negative numbers here have similar effect to using reciprocals. The more pellets there are the larger its negative effect on the choice.

Self Analysis

What was the hardest part of the assignment for you?

Charlie Barber	The hardest part of the assignment was figuring out how to expand the correct number of states for the algorithm. Our code successfully passed all of the tests on 2, 3, and 4, but struggled to pass the last pacman test as we were not passing it the correct agent each time. So we had to rework our code to account for this.
Andrew Tsai	The hardest part of this assignment was getting the correct linear equation for each evaluation function because you have to think about how each number positively or negatively affect each choice.

What was the easiest part of the assignment for you?

Charlie Barber	After completing the minimax agent, the alphaBeta and expectimax agent were pretty easy to implement as the they both followed the base algorithm that minimax followed with some minor tweaks to each algorithm
Andrew Tsai	After completing the Minimax, AlphaBeta and ExpectiMax was fairly simple because they each have similar concepts.

What problem(s) helped further your understanding of the course material?

Charlie Barber	Implementing each algorithm helped to gain a concrete understanding of how they all worked.
Andrew Tsai	Implementing each algorithm helped my understanding of the course material.

Did you feel any problems were tedious and not helpful to your understanding of the material?

Charlie Barber	No. All of the problems were helpful in working towards understanding the material.
Andrew Tsai	None. They were all relevant to the material.

What other feedback do you have about this homework?

Charlie Barber	It was a little hard to understand how to implement the evaluation function. It would have been nice to talk a little bit more in depth about it in class.
Andrew Tsai	Discussing more about the evaluation function as a class or during office hours.