CSE 150 Homework 2 Report

Andrew Hwang A11570188, Eli Eshel-Krohn A11283400, Joshua Anthony A14281769

Reflex Agent

Reflex agent measures the cost/benefit of each move based on the position of the ghosts and food pellets. It first tracks food position, taking the negative distance for each pellet and prioritizing closer pellets. It ensure no contact with ghosts, by giving spaces further from a ghost higher priority over spaces closer to the ghost, but only within 3 spaces of the nearest ghost, so as to ensure this interaction doesn't interrupt tracking of pellets otherwise. It also increases incentive for consumption of pellets by placing a higher prioritization of actions which reduce the overall pellets on the map.

This agent has its shortcomings. It does not consider capsules or consumption of scared ghosts, so these points are lost in total. Additionally, the interaction with ghosts is random as the ghost movement is random, so movement optimality could be affected by this.

Minimax

With the Minimax algorithm, Pacman is good at not dying on larger boards but not good at actually winning games. This is because of the evaluation function used. The default evaluation function greatly decreases the score of an action if a ghost is nearby but doesn't increase greatly if food is nearby, and so this creates a behaviour that prioritises avoiding ghosts rather than collecting food.

In the trappedClassic senario, Pacman moves towards the closest ghost and away from the food, which initially seems like unusual behaviour. However, because minimax expects the ghosts to always behave optimally, it appears that there is no solution to this senario as there is a ghost either side of him. Therefore, both actions (moving right and left) will evaluate to the same score, despite the fact that pacman could potentially win if the blue ghost doesn't act optimally.

Expectimax

Since Pacman doesn't assume the ghosts play with optimal behavior with Expectimax, and instead make moves with an equal probability, he will take the highest average of the evaluated values. Moving towards the food has a higher average than not, even if there is a chance of losing, and so Pacman will win when the ghost acts poorly. Like Minimax, Alpha Beta assumes the ghosts will play optimally in trappedClassic, and so Pacman loses every time.

Evaluation Function

The evaluation function improved the overall score by using a combination of prioritizing movement towards the pellets while keeping nearby ghosts at arm's length. It does this by first considering all ghosts on the map and finding the most nearby one. It ensures prevention of overlap with the ghost by giving it an extremely negative prioritization. In the meantime, it seeks out the pellets by prioritizing them based on how close they are to a ghost, making further pellets higher valued. Upon consuming a capsule, the scare timer is taken into account and instead of running from nearby ghosts, pacman will chase them, given their high value and assuming the scare timer is above the necessary number of moves.

While this evaluation function does improve the search, it is not entirely optimal since it still works off of the ghosts' moves which are random. Also, capsules aren't directly taken into account, so it is possible (though unlikely) that they are not found by pacman, losing points overall.