Report

Q1) I used three features: uneaten food, distance of closest ghost and distance of closest food. The weights are respectively 2,3,1. I chose uneaten food, because having uneaten food reflects badly in our score. I chose closest ghost distance, because it increases the risk of getting caught. I chose closest food, because it is good if we get closer or better, eat food in the next state. Also, for these two distances, I assign higher value if the food/ghost is the same spot as my Pacman, because these are very critical situations. Having reciprocals for the distances is a good idea, because as the food/ghost gets closer, the importance of the feature increases. Negative values for the uneaten food and ghost distance is also a good idea, because these are undesirable situations and should decrease the evaluation (goodness) function.

Q2) Pacman moves faster with Alpha Beta agent, this is because alpha beta prunes the nodes that won’t be in the solution and thus ends up with less computational time. This is especially true when the baby blue ghost is near my Pacman and the three others are in the middle together: Minimax agent takes a lot of time to think about what action to take next.

Q3) Yes, it does behave exactly the same way, because both Minimax and Alpha-Beta algorithms find the optimal path. So, Pacman’s behavior doesn’t change between these algorithms.

Q4) From what I have observed, expectimax is slower than alphabeta but is about the same fastness as minimax. We can also say this looking at the code: Alphabeta prunes some states. So it is faster, however, the codes of the minimax and expectimax also indicate that they have approximately the same speed.

Q5) I have added number of power pallets and score features to the previous algorithms to make my evaluation function more precise. For a better evaluation function, we might need to have more computation per evaluation, but it gives better approximations: It is a trade-off.

Q6) For question 1: I give the highest weight to ghost distance, because if I am too close to a ghost, I might lose the game which is terribly undesirable. I give weight 2 to uneaten food, because this affects the score directly. I give the weight 1 to closest food: It is less than uneaten food, because we are talking about only one piece of food here.

For question 2: For the new variables of power pellets and score, I give the weight of 1 and 10 (after somewhat normalizing the score, because it is a very large number compared to the others). I give the power pellets the weight 1, because they are good but not terribly necessary and I give the weight 10 to score, because eventually this is what we are trying to maximize (our utility).