Ayan Agrawal
Net ID: aka398

Pac-man Competition Summary

I have used the concept of Hybrid algorithm to make the Pacman explore the nodes much faster. For this, I have combined the Greedy Algorithm with the A-Star Algorithm. The problem statement of grabbing all the food placed in the pacman arena is divided into grabbing just the neighbouring food. So, by collecting the individual neighbouring food, pacman will eventually be able to reach the win state. To grab the neighbouring food the concept of Greedy Algorithm is used. As the food is grabbed the score increases. So, the pacman agent is asked to move to next state immediately as and when it encounters the increase in score. There might be a case where there is more than one next state where the food is present. So, a random choice is made for choosing the next state. This randomized algorithm increases the chances of grabbing the food in less time. Also, there might be a situation where there is no food in the neighbouring states. Thus, the pacman will have no clue of the direction where the food is present. Now because the greedy algorithm is not complete, it will have stuck in loops resulting in a non-optimal solution. To avoid this problem and inform pacman about the correct direction to grab the food, A-star algorithm is used with admissible heuristics. For A-star algorithm,

$$\text{Cost} = \text{depth} - (\text{stateEvaluation} - \text{root.stateEvaluation})$$

where depth is the current cost, stateEvaluation is the current node stateEvaluation and root.stateEvaluation is the root node stateEvaluation. Thus, the node with the minimum cost is further explored based on the A-star algorithm and the best action is returned. This avoids expanding paths that are already expensive. As the heuristic used in the A-star algorithm is admissible, it provides an optimal solution to the problem i.e. it never overestimates the cost to reach the goal. Again, the pacman starts looking for the neighbouring food by greedy algorithm. The above cycle is repeated eventually leading the pacman to reach the win state.