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## COMP341 Assignment 4 Report

**I have referenced from the GitHub repository of molson194**

**<https://github.com/molson194/Artificial-Intelligence-Berkeley-CS188/tree/master/Project-4>**

**to write this report and I have not submitted any code related to this homework.**

**Answer of Q1** Pacman already knows possible and legal moves of the ghost. In addition, pacman does not see the ghost, it only knows where the ghost might be. In addition, in test\_cases/q2/2-ExactElapse pacman handles the situation of ghost will eventually go south. Thus, belief distribution will pile up the particles in the southern region of the maze. On the other hand, in test\_cases/q2/1-ExactElapse ghost moves randomly and pacman only hear that the ghost might be on his path but not in any specific region. The ghost might be in any spot around pacman, therefore belief distribution will not pile up the particles in a certain place, distribute randomly and uniformly in the maze.

**Answer of Q2.** Pacman knows the true distance to the ghost. Therefore, in test\_cases/q1/2-ExactObserve pacman cannot move around, since pacman cannot move it can't keep track the true distance change between the pacman and the ghost which forces the pacman to assume the ghost might be in these 4 squares. On the other hand, in test\_cases/q1/3-ExactObserve pacman can move around a specific region and keep track of the current true distance between the ghost and the pacman. If the true distance increases, pacman realizes that the possible spot that ghost might be located in is untrue. Therefore, particles will be diminished from that region. Finally, distance signal receives the distance and pacman understand that ghost is in the opposite direction.

**Answer of Q3.** Particles get re-initialized when Pacman could not find the ghost. The reason of that is when all particles receive zero weight based on the evidence, had to resample all particles from prior to recover. Increasing number of particles would not be a solution, since beliefs are updated by emission mode for stationary position which does not include the movements.

**Answer of Q4.** In approximate inference belief cloud generated by a particle will look noisier than exact inference's belief cloud because of the less accuracy. On the other hand, approximate inference is faster than the exact inference because of the less computation. Less particles may be would not make sense but 5000 particles is quite enough for the map which enable pacman to read more accurate results.

**Answer of Q5.** In q7, we need to deal with multiple ghosts, thus weights of new particles are calculated by getPoistionDistributionForGhost method that takes the new game state, index of the related ghost and agent that uses the outputs the position distribution of ghost. Thus, the function is given, looping the ghost with this method and sampling from the result for each old particle afterwards would give us the new ones.