**COMP341 - Assignment 4 Report**

**Q1- Run the autograder on Q3 and watch the probabilities. Why do they settle even though the ghost is moving? Can you tell the two ghosts apart and if so how?**

The probabilities settle because the probabilities are independent of Ghost position. In the first test, the probabilities start uniform and remain so. In the second test we see the probabilities starting off uniformly and increasing in the South positions. I don’t think we can tell just by probabilities that the ghosts are apart.

**Q2- Why is it the case that in one of them we can find the ghost but not in the other one?**

Our beliefs are updated by the observation, in the second one the Pacman moves, and in the first one it doesn’t. Since it doesn’t move in the first one, it has a limited observation space thus cannot update the probabilities with high information so it cannot find it, however, when it moves it can learn more about the positions and update thus can find the Ghost.

**Q3- Run the autograder on q6 for the 5th and the 6th test case and watch the probabilities. Can you tell when the particles get re-initialized? Comment on the reason(s) on why pacman gets in that situation? Would increasing the number of particles be a solution?**

The particles are re-initialized once the Pacman checks these probabilities and cannot find the Ghost in these locations, and the weights are all turned 0. When this happens, we re-initialize to the initial setting of uniform distribution. Increasing the particles cannot be a solution because same thing would happen even with more particles.

**Q4- Compare how the probabilities evolve between the exact inference and the approximate inference cases (Q2, Q3.2 vs Q5, Q6). Also comment on if 5000 particles make sense for the problems you have seen.**

Exact inference produces more accurate results than approximate inference because it uses real data and calculates all possibilities. In approximate inference we use samples and assigns probabilities to them. Q2 and Q3.2 uses exact inference, and Q5 and Q6 uses particle filtering thus approximate inference. Q2 and Q3.2 evolves slower but has higher accuracy due to doing exact inference. Q4 and Q5 use approximate inference which has less computation, making them evolve faster. Using 5000 particles would only be beneficial when we use elapseTime, when I checked from the test cases folders of Q5 and Q6 I so no cases using it.