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Question 1:

In both cases, the only thing that the Pacman bases its beliefs on is the legal movement probabilities of the ghosts and in the first case since we have a regular ghost we know that there is a uniform and equal movement probability everytime and therefore overtime we will end up with no change at any given t instant in terms of probabilities. It is similar to the idea of a markov chain belief distribution with equal probabilities and in such markov chains over time, lets say t = 500 we will have equal probabilities for each spot. This is a similar idea. Therefore in a certain amount of time the distribution has little to no change. Whereas for the second case based on the movement probabilities we know for a fact that the south going probability is higher and therefore after a while our belief distribution will start to revolve around the south areas since after a while we know that the pacman will end up at as south as it can go. And just like the first case, we will end up with a stable probability belief distribution that has little to no change due to our prdeiction model considering the movement probabilities of the ghost.

Question 2:

Since in the first case we know that the ghost does not move if our pacman agent does not, which is the case here, and that our noisydistance is deterministic when there is no movement, the probability the ghost being located at any point on the circle with a radius of the distance radius does not change. Whereas in the second case our agent can move and therefore the ghosts can as well and at every iteration we will be able to get a different noise distribution and in this case after a while the pacman sees that if it goes towards any other corner other than the southeast, the noisy distance observation increases and therefore after a while the belief of these 3 corners decreases and diverges to zero and we end up being hundred per cent sure that it is in the right bottom corner.

Question 4:

When comparing the exact inference and the approximate inference cases, we see that the probabilities seem to be reasonably reflecting our logic in both cases. The sample sizes seem to be adjusting and set properly as well. Sometimes, usually that is in cases when we have a bigger area of movement, we end up reinitializing and resampling. Sample size increase would make an impact if we had a smlal number at first and we are increasing it but after a certain amount of sample at hand, increase to a big number like 5000 would not make a huge impact. This is because the whole purpose of these samples is to be able to mimic the real probability transitions and the more samples we have the more accurate we are and if we have a certain amount of samples we will already be able to mimic the probability close to perfect. Therefore having more samples than this certain number would have close to no impact to mimicing and would imply cause more computation for the computer to do and therefore increasing the sample size to a huge number to 5000 would not make sense since our smaple size which is smaller than 5000 already has a good enough mimicing of the probability. This is like a tradeoff between how good the program mimics the probability and how much sample calculation the computer wants to make.

Question 3:

Question 4: