Report AI

Question 6:

$$B(X_{t+1}) \propto_{X_{t+1}} P(e_{t+1} \mid X_{t+1}) B'(X_{t+1})$$

Or easier :

$$B(X) \propto P(e \mid X) B'(X)$$

Question 7:

$$P(X_{t+1} \mid e_{1:t}) = \sum_{x_t} P(X_{t+1} \mid x_t) P(x_t \mid e_{1:t})$$

Or better :

$$B'(X_{t+1}) = \sum_{x_t} P(X' \mid x_t) B(x_t)$$

Question 8:

The tests result in an average score of 754.7 when using the greedy strategy. Although, there is a high chance that the pacman hunts ghosts that are somewhere else. Take the example of 2 ghosts. One ghost has a distribution over 4 positions (let us say that all other positions have a propability of zero):

- position 1: distance to pacman is 3 tiles with a probability of 0.25
- position 2: distance to pacman is 5 tiles with a probability of 0.25
- position 3: distance to pacman is 6 tiles with a probability of 0.24
- position 4: distance to pacman is 1 tiles with a probability of 0.26

The other ghost has a distribution over only one position that is 2 tiles away from the pacman with a possibility of 1.0. The greedy strategy would hunt the first ghost because it thinks that that ghost is the shortest away. Although, in reality, the chances of the first ghost being the closest is 26% or roughly ¼. It would be better to hunt down the second ghost which is certain to be close. I implemented this by simply dividing the distance with probability (the belief of the position where the ghost is most likely hiding). This gives an average score of 759.0.

Question14 :

In Test 1, only the function `elapseTime` is used, which is responsible for updating the particle filter's ghost position estimates based on the previous time step and the transition model. Since the real ghost positions are unknown, the function uses particle-based estimation, resulting in less accurate initial estimates that improve over time.

In Test 3, both `observeUpdate` and `elapseTime` functions are used. The `observeUpdate` functions updates the particle filter's ghost position estimates by observing the ghosts positions and their likelihood. Pacman knows the ghosts' movement and actual positions at the exact time, making it more accurate.