INFO8006: Project 3 - Report

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1 Bayes filter

a. The observable evidence variables at time t are defined in this way for the ghost i :

$$noisyDistance(i) = manhattanDistance(ghost(i), Pacman) + Binom(n, p) - n * p$$

where *noisyDistance(i)* corresponds to the observable evidence variable which is tracking the ghost i at time t, *manhattanDistance(ghost(i), Pacman)* corresponds to the Manhattan distance between the ghost i and Pacman at time t, *Binom(n, p)* corresponds to a random variate following a binomial distribution with the given parameters n and p, $p = \frac{1}{2}$, and n = $\frac{sensor\_var}{p\ (1-p)} = \frac{sensor\_var}{\frac{1}{4}}$ with *sensor_var* being the variance of the rusty sensor.

b. The transition model $P(X_t|X_{t-1}, ghostType)$ given all the legal actions at state X_{t-1} and ghostType $\in$ {confused, afraid, scared} corresponding to the ghost type can be defined as :

$$P(X_t|X_{t-1}, ghostType) = \begin{cases} P(X_t|X_{t-1}, ghostType) = \frac{1}{\#legalActions(X_{t-1})} \text{ if ghostType = confused} \\ P(X_t|X_{t-1}, ghostType) = \frac{2}{\#legalActions(X_{t-1})} \text{ if ghostType = afraid and} \\ manhattanDist(Pacman, X_t) \geq manhattanDist(Pacman, X_{t-1}) \\ P(X_t|X_{t-1}, ghostType) = \frac{8}{\#legalActions(X_{t-1})} \text{ if ghostType = scared and} \\ dist(Pacman, X_t) \geq manhattanDist(Pacman, X_{t-1}) \\ P(X_t|X_{t-1}, ghostType) = \frac{1}{\#legalActions(X_{t-1})} \text{ else} \end{cases}$$

where $\#legalActions(X_{t-1})$ corresponds to the number of different legal actions for the state X_{t-1} and $manhattanDist(Pacman, s)$ corresponds to the Manhattan distance between Pacman and the ghost in state s. Note that if the probability is > 1, it should be reduced to 1.

2 Implementation

a. ***Leave empty.***

3 Experiment

a.

b.

c.

d.

e.

f.

g. ***Leave empty.***