

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 $P_a(X_t|X_{t-1}, g)$, with a being a legal action taken and g being the type of ghost (confused, afraid, scared), is, in general, $P_a(X_t|X_{t-1}, g) = \alpha * \gamma$. In detail :

$$P_a(X_t|X_{t-1}, g) = \begin{cases} P_a(X_t|X_{t-1}, g) = \alpha * 1 & \text{if } g = \text{confused} \\ P_a(X_t|X_{t-1}, g) = \alpha * 2 & \text{if } g = \text{afraid and } d(X_t, P) \geq d(X_{t-1}, P) \\ P_a(X_t|X_{t-1}, g) = \alpha * 8 & \text{if } g = \text{scared and } d(X_t, P) \geq d(X_{t-1}, P) \\ P_a(X_t|X_{t-1}, g) = \alpha * 1 & \text{else} \end{cases}$$

where:

- $d(X_t, P)$ is the Manhattan distance between Pacman and the ghost at time t .
- $\alpha = \frac{1}{\sum_{i=1}^N \gamma_i}$ with N being the number of legal actions.

2 Implementation

- a. *Leave empty.*

3 Experiment

- a.
b.
c.
d.
e.
f.

- g. *Leave empty.*