

Homework 2

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Q1.

Homework 2.

Q2. The predicted belief equals the current belief because doing nothing leaves state unchanged.

∴ Transition model (do nothing):

$$P(x_{t+1} = \text{open} \mid x_t = \text{open}, u = \text{none}) = 1$$

$$P(x_{t+1} = \text{closed} \mid x_t = \text{closed}, u = \text{none}) = 1$$

$$P(x_{t+1} = \text{open} \mid x_t = \text{closed}, u = \text{none}) = 0$$

$$P(x_{t+1} = \text{closed} \mid x_t = \text{open}, u = \text{none}) = 0$$

$$\therefore \bar{bel}(\text{open}) = bel(\text{open})$$

$$\bar{bel}(\text{closed}) = bel(\text{closed})$$

Q2.

Q2.

step 1. $\because \text{bel}(\text{open}) = 0.878 < 0.9 \therefore u = \text{push}$

$$\overline{\text{bel}}(\text{open}) = 0.878 \cdot 1 + 0.122 \cdot 0.6 = 0.878 + 0.0732 = 0.9512$$

$$\overline{\text{bel}}(\text{c/sd}) = 0.878 \cdot 0 + 0.122 \cdot 0.4 = 0.0488$$

$$p(z) = 0.9 \cdot 0.9512 + 0.5 \cdot 0.0488 = 0.85608 + 0.0244 = 0.88048$$

$$\text{bel}^+(\text{open}) = \frac{0.85608}{0.88048} = 0.97229 \approx 0.972$$

$$\text{bel}^+(\text{c/sd}) = \frac{0.0244}{0.88048} = 0.02771 \approx 0.028$$

Step 2.

$\because \text{bel}(\text{open}) = 0.972 \geq 0.9 \therefore u = \text{none}$

$$\therefore \overline{\text{bel}}(\text{open}) = 0.972, \overline{\text{bel}}(\text{c/sd}) = 0.028$$

$$p(z) = 0.9 \cdot 0.972 + 0.5 \cdot 0.028 = 0.875 + 0.014 = 0.889$$

$$\text{bel}^+(\text{open}) = \frac{0.875}{0.889} \approx 0.984$$

$$\text{bel}^+(\text{c/sd}) = \frac{0.014}{0.889} \approx 0.016$$

Step 3, $\because \text{bel}(\text{open}) = 0.984 \geq 0.9 \therefore u = \text{none}$

$$\overline{\text{bel}}(\text{open}) = 0.984, \quad \overline{\text{bel}}(\text{closed}) = 0.016$$

$$p(z) = 0.9 \cdot 0.984 + 0.5 \cdot 0.016 = 0.886 + 0.008 = 0.894$$

$$\text{bel}^+(\text{open}) = \frac{0.886}{0.894} \approx 0.991$$

$$\text{bel}^+(\text{clsd}) = \frac{0.008}{0.894} \approx 0.009$$

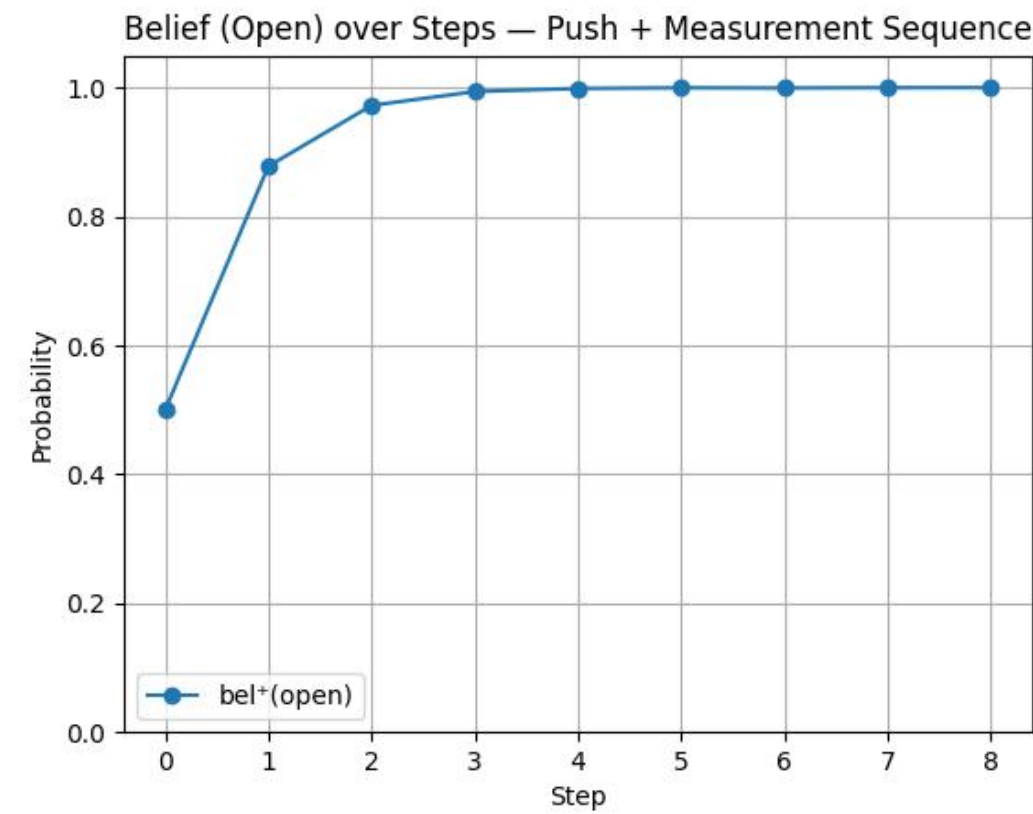
Step 4, $\because \text{bel}(\text{open}) = 0.991 > 0.99 \therefore u = \text{go!}$

step	bel(open)	bel(clsd)	action	bel(open)	bel(clsd)	bel+(open)	bel+(clsd)
0	0.5	0.5	push	0.800	0.200	0.878	0.122
1	0.878	0.122	push	0.951	0.049	0.972	0.028
2	0.972	0.028	measure	0.972	0.028	0.984	0.016
3	0.984	0.016	measure	0.984	0.016	0.991	0.009
4	0.991	0.009	go!				

Q3.

Code link:

[add h2 code • White8848/Probability-Robot@4969b10](#)



step	bel_o	bel_c	bbar_o	bbar_c	z	b+_o	b+_c
0	0.500	0.500				0.500	0.500
1	0.500	0.500	0.800	0.200	open	0.878	0.122
2	0.878	0.122	0.951	0.049	open	0.972	0.028
3	0.972	0.028	0.989	0.011	open	0.994	0.006
4	0.994	0.006	0.998	0.002	open	0.999	0.001
5	0.999	0.001	0.999	0.001	open	1.000	0.000
6	1.000	0.000	1.000	0.000	closed	0.999	0.001
7	0.999	0.001	1.000	0.000	open	1.000	0.000
8	1.000	0.000	1.000	0.000	open	1.000	0.000