Ex -Sheet 05

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Exercise 1.

c) $p(\text{home}) = 0.7$

$p(\text{uni}) = 0.3$

$p(\text{others}) = 0$

$$bel(x_{t+1}) = \eta\, p(z|x_t) \underbrace{\sum p(x_{t+1}|x_t, u)\, bel(x_t)}$$

there is no action → $bel(x_t)$

$$= \eta\, p(z|x_t)\, bel(x_t) \Rightarrow$$

$$bel(\text{home}) = \frac{0.0114 \cdot 0.7}{0.0114 \cdot 0.7 + 0.0978 \cdot 0.3}$$

Exercise 2: Sensor Model

$z = \begin{pmatrix} z_r \\ z_\theta \end{pmatrix}$ $\mathcal{N} = \begin{pmatrix} \sigma_r^2 \\ \sigma_\theta^2 \end{pmatrix}$

$p(z_r, z_\theta) = p(z_r)p(z_\theta)$ independence

$p(z|x, l)$ sensor model ?

pose

landmark

measurement

sensor model: probability of measurement given the pose of robot for landmark l.

$$\mathcal{N}(z - \hat{z} \mid x, l)$$

$$\hat{z} := \begin{pmatrix} \hat{z}_r \\ \hat{z}_\theta \end{pmatrix} = \begin{pmatrix} \mathrm{norm}(x - l) \\ \mathrm{atan2}\left(\dfrac{l_y - x_y}{l_x - x_x}\right) \end{pmatrix}$$

$$p(z \mid x, l) = \mathrm{np.prod}\left(\mathrm{stat.norm}\left(\mathrm{loc} = \begin{pmatrix} 0 \\ 0 \end{pmatrix}, \mathrm{scale} = \begin{pmatrix} \sigma_r \\ \sigma_\theta \end{pmatrix}\right).\mathrm{pdf}(z - \hat{z})\right)$$