belief_mean init.

ii loop

mobility init: $\begin{cases} q_j(t) = x_j + \frac{1}{2}N(0,\sigma_d) + v_j \Delta t \\ \psi^q_j(t) = \sigma_d + \begin{bmatrix} 0.1 \\ 1.0 \end{bmatrix} \end{cases}$

belief_variance init

movement variation

sum-product init: $\begin{cases} \hat{x}_j(l) = q_j(t) \\ \psi^{\hat{x}}_j(l) = \psi^q_j(t) \end{cases}$

$$\begin{cases} d_{kj} = \| x_k - x_j \|_2 \\ \theta_{kj} = \tan^{-1}\left(\frac{x_{1k} - x_{1j}}{x_{2k} - x_{2j}} \right) \end{cases}$$

i.e. from j to k

$$\Rightarrow x_k = x_j + d_{kj} \begin{bmatrix} \cos\theta_{kj} \\ \sin\theta_{kj} \end{bmatrix}$$

measurement init: $\begin{cases} \Delta_{kj}(l) = 0 \\ \psi^\Delta_{kj}(l) = 0 \end{cases}$

iter loop

j loop

$\sum \frac{\Delta_{hj}}{\psi^\Delta_{hj}} = 0$, $\sum \frac{1}{\psi^\Delta_{hj}} = 0$ init

k loop, if $k \neq j$:

$$\Delta_{kj}(l) = \hat{x}_k(l-1) - d_{kj} \begin{bmatrix} \cos\theta_{kj} \\ \sin\theta_{kj} \end{bmatrix}$$

$$\psi^\Delta_{kj}(l) = \psi^{\hat{x}}_k(l-1) + \begin{bmatrix} \sigma_d^2 \cos^2\theta_{kj} + d_{kj}\sigma_\theta^2 \sin^2\theta_{kj} \\ \sigma_d^2 \sin^2\theta_{kj} + d_{kj}\sigma_\theta^2 \cos^2\theta_{kj} \end{bmatrix}$$

$$\sum \frac{\Delta_{hj}}{\psi^\Delta_{hj}} \mathrel{+}= \frac{\Delta_{kj}}{\psi^\Delta_{kj}}, \quad \sum \frac{1}{\psi_{hj}} \mathrel{+}= \frac{1}{\psi^\Delta_{kj}}$$

end

$$\psi^{\hat{x}}_j(l) = \left(\frac{1}{\psi^q_j(t)} + \sum \frac{1}{\psi^\Delta_{hj}} \right)^{-1}$$

$$\hat{x}_j(l) = \psi^{\hat{x}}_j(l) \cdot \left(\frac{q_j(t)}{\psi^q_j(t)} + \sum \frac{\Delta_{hj}}{\psi_{hj}} \right)$$

end

end

belief_mean = $q_j(t)$, belief_var = $\psi^q_j(t)$

end