SENSORFUSION 4

2 A) Derive the measurement likelihood using the total probability theorem

$$p(z_k \mid z_{1:k-1}) = \sum_{s_k} \int p(z_k \mid x_k, s_k)\, p(x_k \mid s_k, z_{1:k-1})\, Pr(s_k \mid z_{1:k-1})\, dx_k$$

$$= \sum_{s_k} \Lambda_k^{s_k}\, Pr(s_k \mid z_{1:k-1}) \quad \text{from eq. (6.32)}$$

$$= \sum_{s_k} N\left(z_k;\, h^{s_k}(\hat{x}_{k|k-1}^{s_k}),\, S_k^{s_k}\right)$$

B) Assume $p(x_k \mid z_{1:k-1}) \approx \sum_{i=1}^{n} w_k^i\, \delta(x_k - x_k^i)$ (*)

Derive $p(z_k \mid z_{1:k-1})$ of this PF

$$p(z_k \mid z_{1:k-1}) = \int p(z_k \mid x_k)\, p(x_k \mid z_{1:k-1})\, dx_k$$

USING

$$\approx \int p(z_k \mid x_k) \sum_{i=1}^{n} w_k^i\, \delta(x_k - x_k^i)\, dx_k$$

$$= \sum_{i=1}^{n} p(z_k \mid x_k^i)\, w_k^i$$