

Algorithmic representation of PHD-EF

Given $\{w_{k-1}^{(i)}, \mathbf{m}_{k-1}^{(i)}, \mathbf{P}_{k-1}^{(i)}\}_{i=1}^{J_{k-1}}$ and the soft measurement set $\mathbf{Z}_k = \left\{ \left\{ o_k^{(j,l)}, \mathbf{z}_k^{(j,l)}, \mathbf{D}_k^{(j,l)} \right\}_{l=1}^{d_{k,j}} \right\}_{j=1}^m$.

Step 1. (Prediction for birth targets)

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i = 0.
for j = 1, ..., Jγ,k
    i := i + 1.
     $w_{k|k-1}^{(i)} = w_{\gamma,k}^{(j)}, \mathbf{m}_{k|k-1}^{(i)} = \mathbf{m}_{\gamma,k}^{(j)}, \mathbf{P}_{k|k-1}^{(i)} = \mathbf{P}_{\gamma,k}^{(j)}$ .
end
for l = 1, ..., Jβ,k
    for j = 1, ..., Jk-1
        i := i + 1.
         $w_{k|k-1}^{(i)} = w_{k-1}^{(j)} w_{\beta,k}^{(l)}, \mathbf{m}_{k|k-1}^{(i)} = \mathbf{F}_{\beta,k-1}^{(l)} \mathbf{m}_{k-1}^{(j)} + d_{\beta,k-1}^{(l)}, \mathbf{P}_{k|k-1}^{(i)} = \mathbf{Q}_{\beta,k-1}^{(l)} + \mathbf{F}_{\beta,k-1}^{(l)} \mathbf{P}_{\beta,k-1}^{(j)} (\mathbf{F}_{\beta,k-1}^{(l)})^T$ .
    end
end

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Step 2. (Prediction for existing targets)

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for j = 1, ..., Jk-1
    i := i + 1.
     $w_{k|k-1}^{(i)} = p_{S,k} w_{k-1}^{(j)}, \mathbf{m}_{k|k-1}^{(i)} = \mathbf{F}_{k-1} \mathbf{m}_{k-1}^{(j)}, \mathbf{P}_{k|k-1}^{(i)} = \mathbf{Q}_{k-1} + \mathbf{F}_{k-1} \mathbf{P}_{k-1}^{(j)} \mathbf{F}_{k-1}^T$ .
end
Jk|k-1 = i.

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Step 3. (Update)

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for j = 1, ..., Jk-1
     $w_k^{(j)} = (1 - p_{D,k}) w_{k|k-1}^{(j)}, \mathbf{m}_k^{(j)} = \mathbf{m}_{k|k-1}^{(j)}, \mathbf{P}_k^{(j)} = \mathbf{P}_{k|k-1}^{(j)}$ 
end
e := 0.
for j = 1, ..., m
    for l = 1, ..., dk,j
        for i = 1, ..., Jk|k-1
            e := e + 1.
             $\mathbf{K}_k^{(i,j,l)} = \mathbf{P}_{k|k-1}^{(i)} \mathbf{H}_k^T (\mathbf{H}_k \mathbf{P}_{k|k-1}^{(i)} \mathbf{H}_k^T + \mathbf{D}_k^{(j,l)})^{-1}$ 
             $w_k^{(J_{k|k-1}+e)} = p_{D,k} w_{k|k-1}^{(i)} o_k^{(j,l)} \mathcal{N}(\mathbf{z}_k^{(j,l)}; \mathbf{H}_k \mathbf{m}_{k|k-1}^{(i)}, \mathbf{D}_k^{(j,l)} + \mathbf{H}_k \mathbf{P}_{k|k-1}^{(i)} \mathbf{H}_k^T)$ 
             $\mathbf{m}_k^{(J_{k|k-1}+e)} = \mathbf{m}_{k|k-1}^{(i)} + \mathbf{K}_k^{(i,j,l)} (\mathbf{z}_k^{(j,l)} - \mathbf{H}_k \mathbf{m}_{k|k-1}^{(i)})$ 
             $\mathbf{P}_k^{(J_{k|k-1}+e)} = (\mathbf{I} - \mathbf{K}_k^{(i,j,l)} \mathbf{H}_k) \mathbf{P}_{k|k-1}^{(i)}$ 
        end
    end
     $w_k^{(J_{k|k-1}+b)} := \frac{w_k^{(J_{k|k-1}+b)}}{\kappa_k(\mathbf{o}_j) + \sum_{a=e-e_j+1}^e w_k^{(J_{k|k-1}+a)}}, \text{ for } b = e - e_j + 1, \dots, e, \text{ where } e_j = d_{k,j} \times J_{k|k-1}.$ 
end
Jk = Jk|k-1 (1 + m × dk,j).

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Output $\{w_k^{(i)}, \mathbf{m}_k^{(i)}, \mathbf{P}_k^{(i)}\}_{i=1}^{J_k}$.