

ML-EM Algorithm Working

$$\hat{f}_j^{(n+1)} = \frac{\hat{f}_j^{(n)}}{\sum_{i'} h_{i'j}} \sum_i h_{ij} \frac{g_i}{\sum_k h_{ik} \hat{f}_k^{(n)}} \quad (30)$$

Terms :

$\hat{f}_j^{(n)} \Rightarrow$ Reconstructed Image (n^{th} iteration)

$\sum_{i'} h_{i'j} \Rightarrow$ Sum of Sysmat (along axis 0)

$g_i \Rightarrow$ Projection of Phantom on Sysmat

$\sum_i h_{ij} \Rightarrow$ sysmat

$\sum_k h_{ik} \hat{f}_k^{(n)} \Rightarrow$ Sysmat \times Reconstructed Image [matrix multiplication]

Algorithm FlowChart

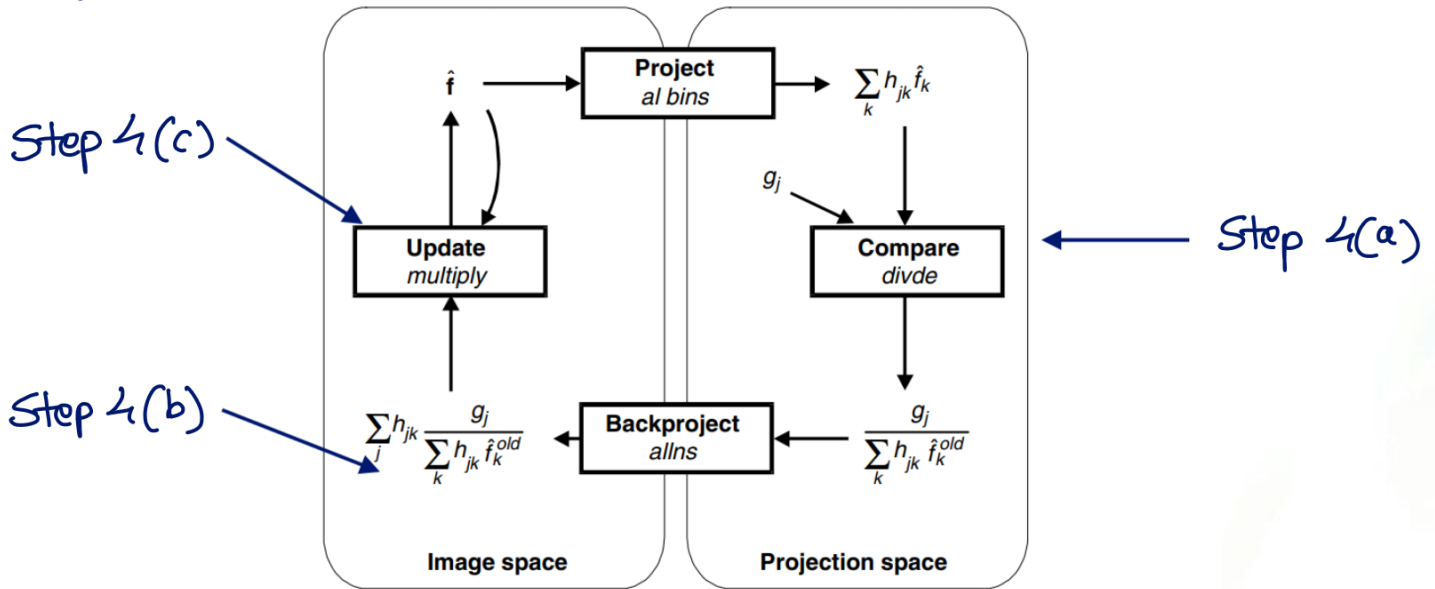


FIGURE 10 The maximum-likelihood expectation-maximization algorithm in the form of the general iterative model.

Steps

$$1) \text{Img}(\hat{f}) = \text{Matrix (All ones)}$$

$$2) \text{Sysmat} = \text{Generated using Sysmat Generation Module} \quad \left(\begin{array}{l} \text{a) Converting to 2D} \\ \text{b) Remove detector rows which detects no photons} \end{array} \right)$$

$$3) \text{Projection}(g_j) = \text{Sysmat} \times \text{Phantom}$$

$$4) \text{Iterate (Back Projection)}$$

$$(a) \text{Quotient} = \frac{\text{Projection}}{(\text{Sysmat} \times \text{Img})}$$

$$(b) \text{Img}' = \text{Q} \times \text{Sysmat} \times \frac{1}{\text{sum}(\text{Sysmat})} \times \text{Img}$$

$$(c) \text{Img}' \Rightarrow \text{Img}$$