

MAP EM Algorithm

$$\hat{f}_j^{(n+1)} = \frac{\hat{f}_j^{(n)}}{\sum_i h_{ij} + \beta \frac{\partial U(\mathbf{f})}{\partial \mathbf{f}}} \sum_i h_{ij} \frac{g_i}{\sum_k h_{ik} + \hat{f}_k^{(n)}} \quad (39)$$

Terms:

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

$\sum_i h_{ij} \Rightarrow$ Sum of Sysmat (along axis 0)

$\beta \Rightarrow$ Degree of Smoothing (Weight factor)

$\frac{\partial U(\mathbf{f})}{\partial \mathbf{f}} \Rightarrow$ Potential function

$g_i \Rightarrow$ Projection

$\sum_i h_{ij} \Rightarrow$ Sysmat

$\sum_k h_{ik} + \hat{f}_k^{(n)} \Rightarrow$ Sysmat + Reconstructed Image

Algorithm Flowchart

Steps

- 1) $\text{Img}(\hat{f}) \Rightarrow \text{Matrix (All ones)}$
- 2) $\text{Sysmat} \Rightarrow \text{Generated using Sysmat Gen Module}$
- 3) $\text{Projection}(g_i) \Rightarrow \text{Sysmat} \times \text{Phantom}$

Iterate

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

b) $\text{Numerator} = Q \times \text{Sysmat}$

c) $\text{Denominator} = \text{Sum}(\text{sysmat})$

d) Loop - Length of Img times (j)

$\text{prior gradient} = \text{Prior Function}(j^{\text{th}} \text{ row of image})$
 $\text{denominator}[j] += \text{prior_gradient}$

e) $\text{Img}' = \text{Img} \times \frac{\text{numerator}}{\text{denominator}}$

d) $\text{Img} = \text{Img}'$

Prior Function

Quadratic
 $\hookrightarrow \beta \times (\text{pixel value})^2$