Laplacian Smoothing

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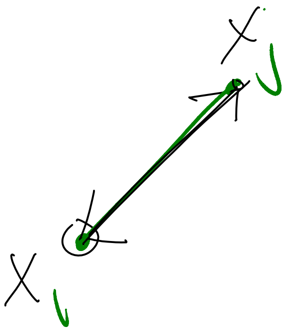
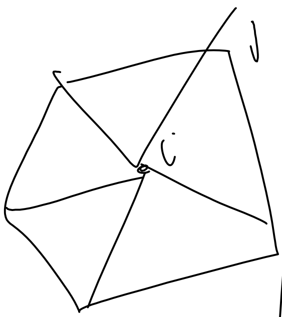
$\Delta x_i \qquad i = 1, \ldots, V$



$$\Delta x_i = \sum_{j \in i^*} w_{ij} (x_j - x_i)$$



$\{ \delta_i = 0$

$\Delta x_i = 0 \qquad i = 1 \ldots V$

$\forall e = (i,j) \; \{ \; \boxed{\delta_{ij} = 1} \; ; \; \boxed{\delta_{ji} = 1}$

$\Delta x_i = \Delta x_i + \delta_{ij} (x_j - x_i)$

$\Delta x_j = \Delta x_j + \delta_{ji} (x_i - x_j)$

$\delta_i = \delta_i + \delta_{ij}$

$\delta_j = \delta_j + \delta_{ji}$

$\}$

for $i = 1 \ldots V$

$\Delta x_i = \Delta x_i / \delta_i$

Δx

Laplacian Step (λ)

for $i = 1 \ldots V$

$x_i = x_i + \lambda \Delta x_i$

Laplacian Smoothing (λ)

$\{$ Compute Δx

N | Laplacian Smoothing (λ)

N (Compute ΔX
Laplacian Smoothing (λ)

Weights

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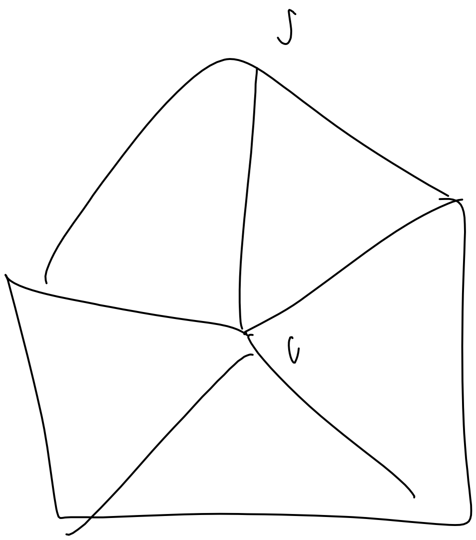

$$\delta_{ij} > 0$$

$$\delta_{ij} = \delta_{ji}$$

$$\delta_i = \sum_j \delta_{ij}$$

$$w_{ij} = \frac{\delta_{ij}}{\delta_i}$$

$$\sum_j w_{ij} = 1$$

Functions of Matrices f(K)

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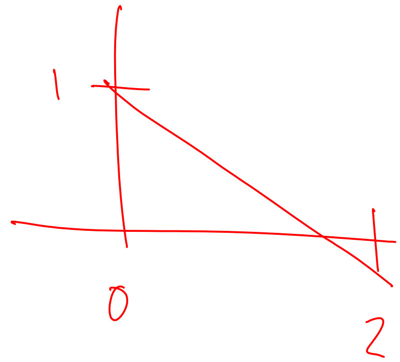
$$f(k) = 1 - \lambda k$$



$$K = I - W$$

$$f(K) = I - \lambda K \qquad -K$$

$$x' = f(K)x = \underbrace{x - \lambda K x}_{x + \lambda \Delta x}$$

$$f(k) = (1-\lambda k)(1-\mu k) = \overset{f_0}{1} - \overset{f_1}{(\lambda+\mu)}\, k + \overset{f_2}{\lambda\mu}\, k^2$$

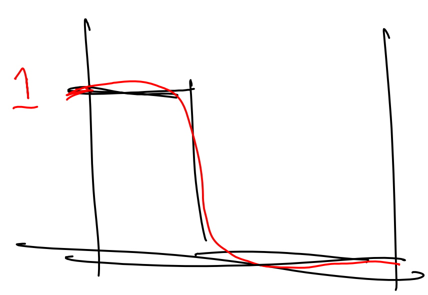
$$f(K) = f_0 I + f_1 K + f_2 K^2 =$$

$$\left(f_0 + K\boxed{(f_1 + f_2 K)}\right) \leftarrow$$

$$f(k) = f_0 + f_1 k + f_2 k^2 =$$

$$g = f_1 + f_2 k$$

$$k'' = f_0 + g k$$



Hierarchical Smoothing

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