

Explain the high-pass filtering. Exemplify the Laplacian filter

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Laplacian filter: structure

$$\nabla^2 f(x, y) = f(x-1, y) + f(x+1, y) + f(x, y-1) + f(x, y+1) - 4f(x, y)$$

It gives the filter below:

$$\begin{bmatrix} 0 & 1 & 0 \\ 1 & -4 & 1 \\ 0 & 1 & 0 \end{bmatrix}$$

It's possible to see this filter, which is also a laplacian filter

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & -8 & 1 \\ 1 & 1 & 1 \end{bmatrix}$$

Laplacian filter: example

Original image



Laplacian filter (version -4)



Laplacian filter (version -8)



Using laplacian filter to enhance image

Original image



Image blurred



Laplacian image



Enhanced image with parameter 2

