Scale

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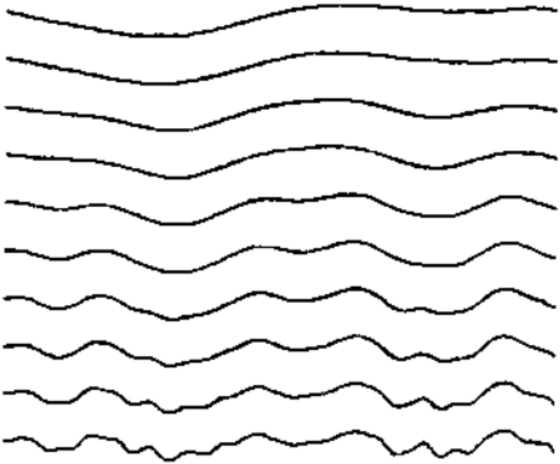
Input for slides includes content by Kyros Kutulakos, Bob Fisher and Witkin

Witkin's one dimensional Gaussian smoothing



Laplacian Mask

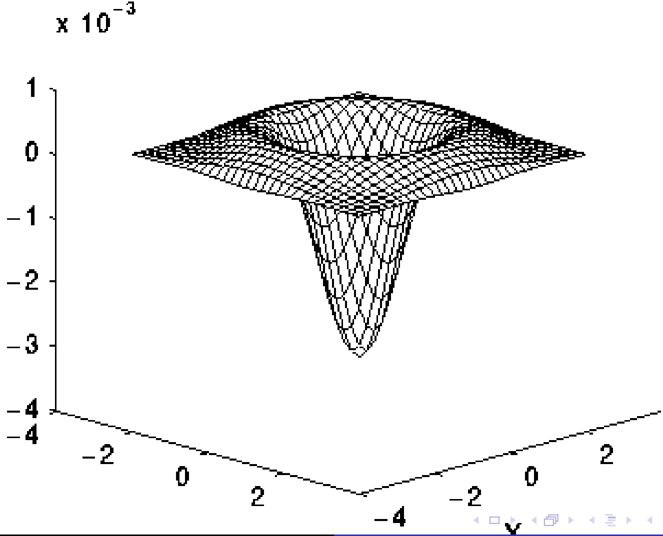
0	−1	0
−1	4	−1
0	−1	0

−1	−1	−1
−1	8	−1
−1	−1	−1

LoG equation

$$LoG(x,y) = -\frac{1}{\pi\sigma^4}\left[1 - \frac{x^2+y^2}{2\sigma^2}\right]e^{-\frac{x^2+y^2}{2\sigma^2}}$$

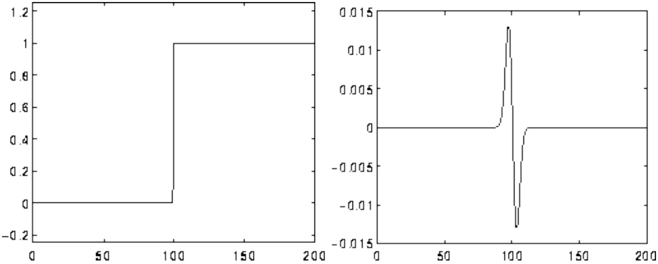
LoG Continuous waveform



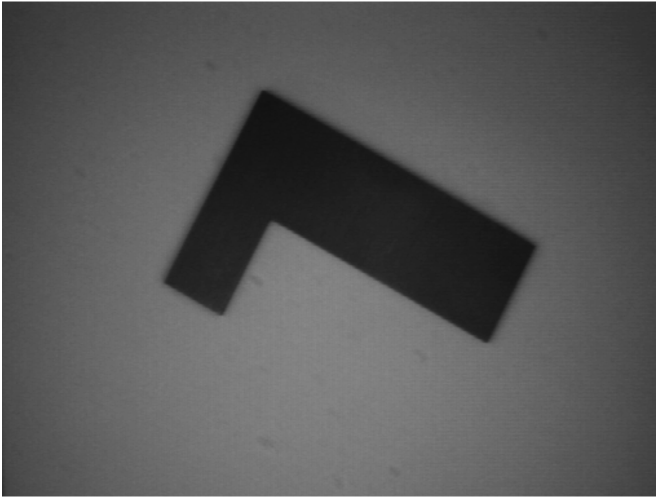
LoG discrete values

0	1	1	2	2	2	1	1	0
1	2	4	5	5	5	4	2	1
1	4	5	3	0	3	5	4	1
2	5	3	-12	-24	-12	3	5	2
2	5	0	-24	-40	-24	0	5	2
2	5	3	-12	-24	-12	3	5	2
1	4	5	3	0	3	5	4	1
1	2	4	5	5	5	4	2	1

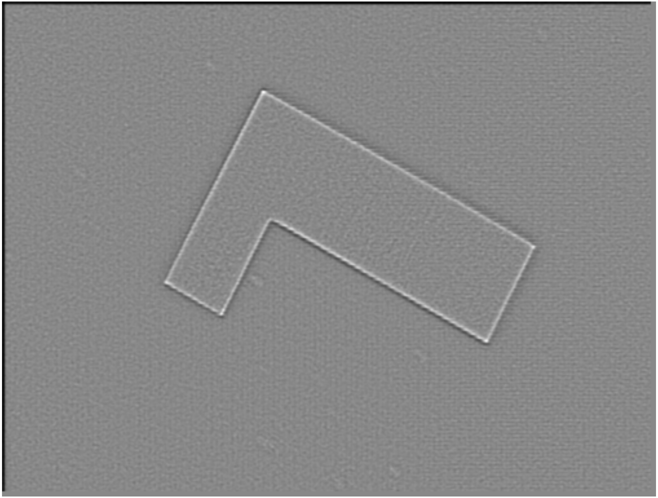
LoG Response



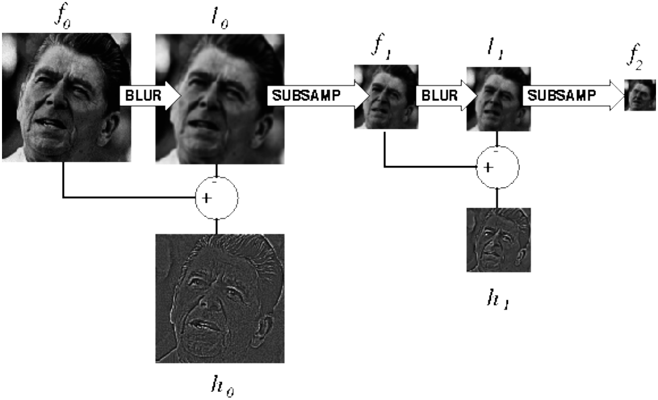
LoG Example Input



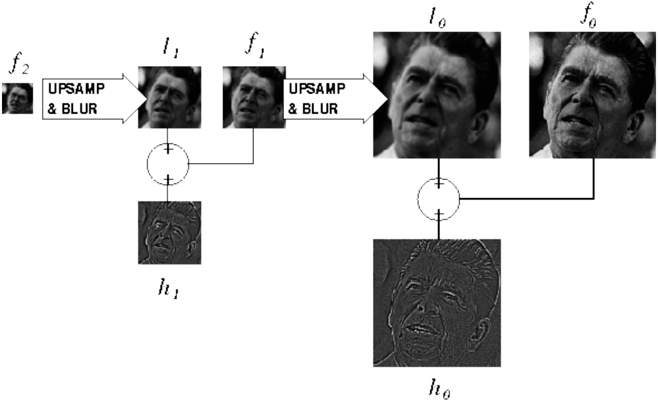
LoG Example Output



Decomposition of Laplacian pyramid



Reconstruction of Laplacian pyramid



Haar wavelet example 1D

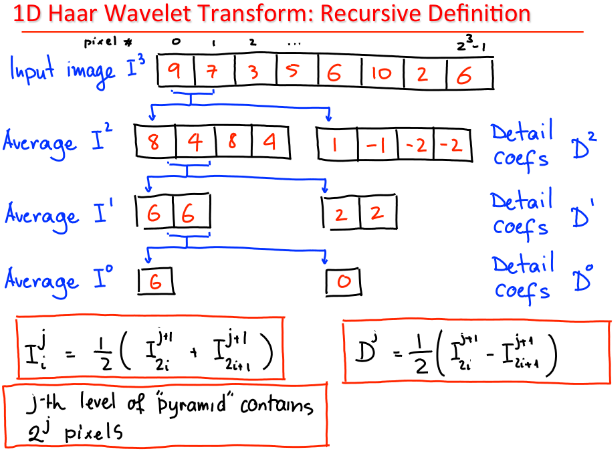
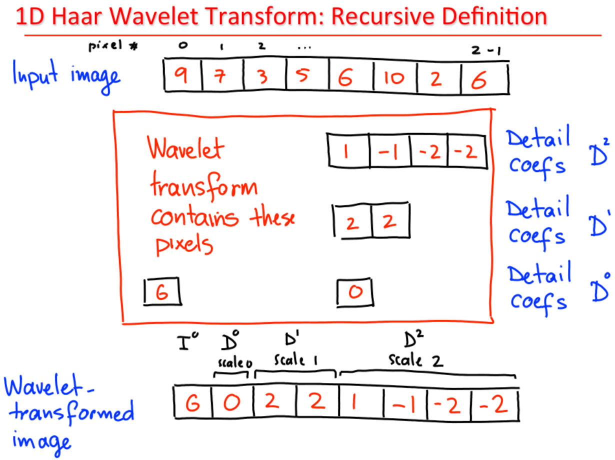


Figure from Kyros Kutulakos

Haar wavelet example 1D



2D Haar wavelet basis

The 2-D Haar Wavelet Basis

Definition of the first few (coarsest scale) wavelet coefficients of an image of dimensions of 2^N x 2^N

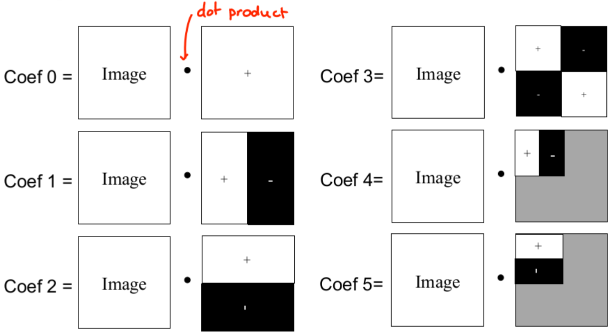
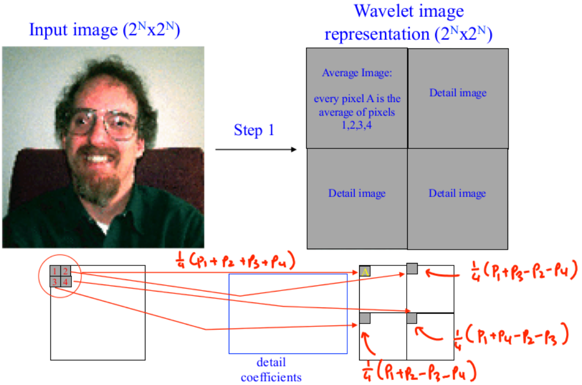


Figure from Kyros Kutulakos

2D Haar wavelet example

The Haar 2-D Wavelet Transform

The 2-D Haar Wavelet Transform corresponds to a modification of this minimal recursive transform



2D Haar inverse wavelet example

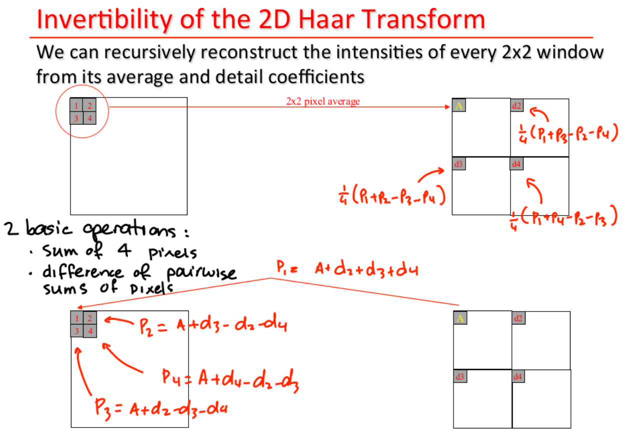
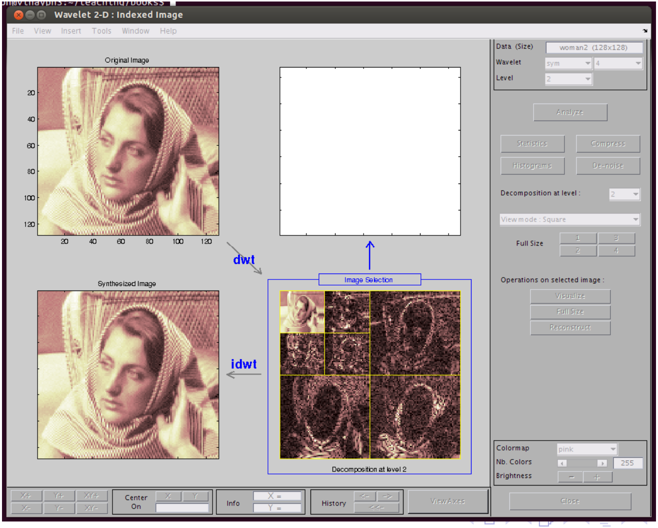
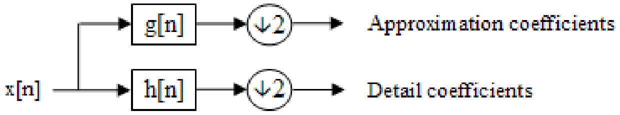


Figure from Kyros Kutulakos

Wavelet decomposition example



Wavelet detail and approximate by filtering



Wavelets Filter bank