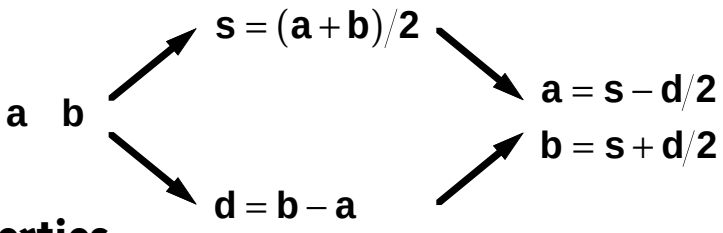
Haar Transform

Averages and differences

- two neighboring samples

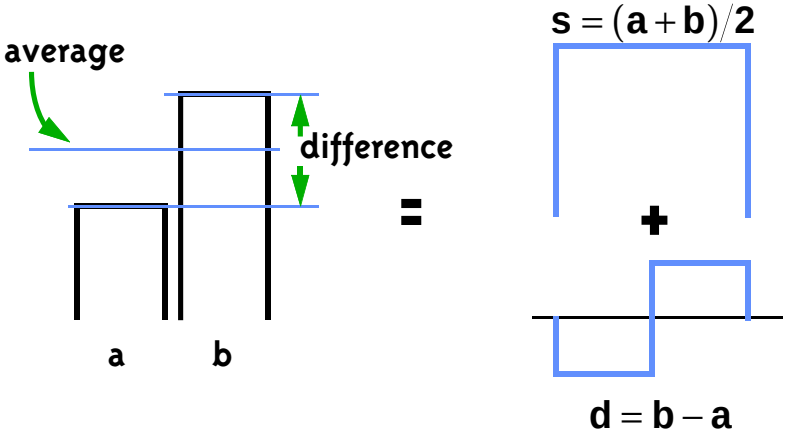


Properties

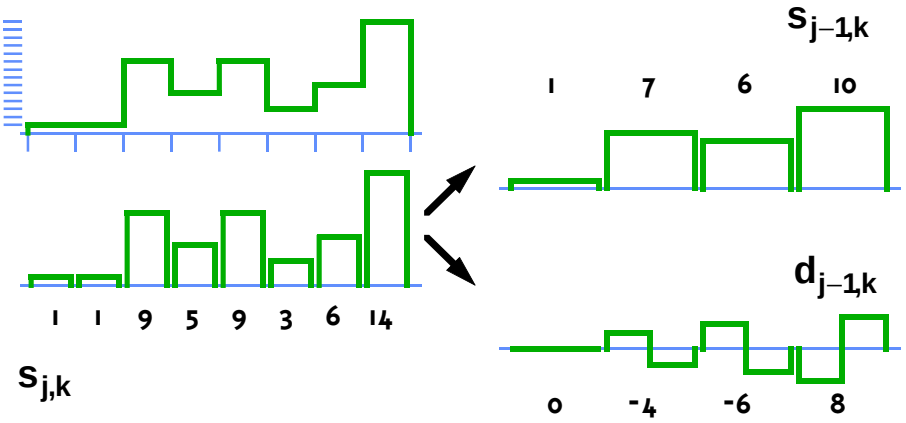
- exploits correlation
- better encoding possible

Haar Transform

Box function and Haar wavelet

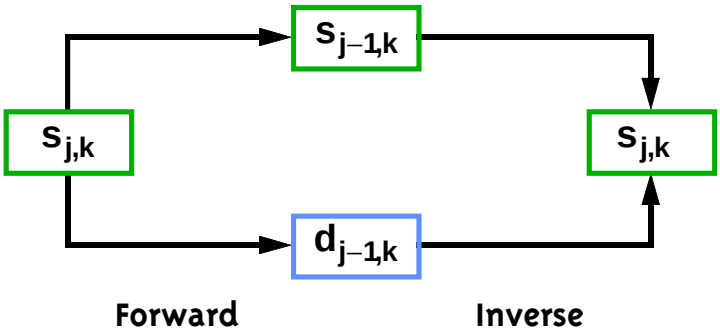


Haar Transform

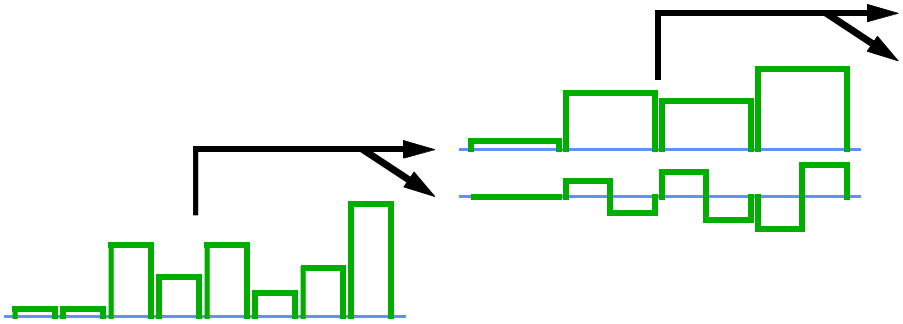


General Structure

Single level step and its inverse



Haar Transform



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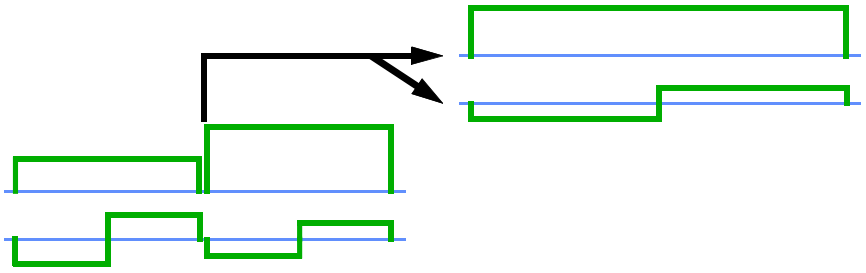
Haar Transform



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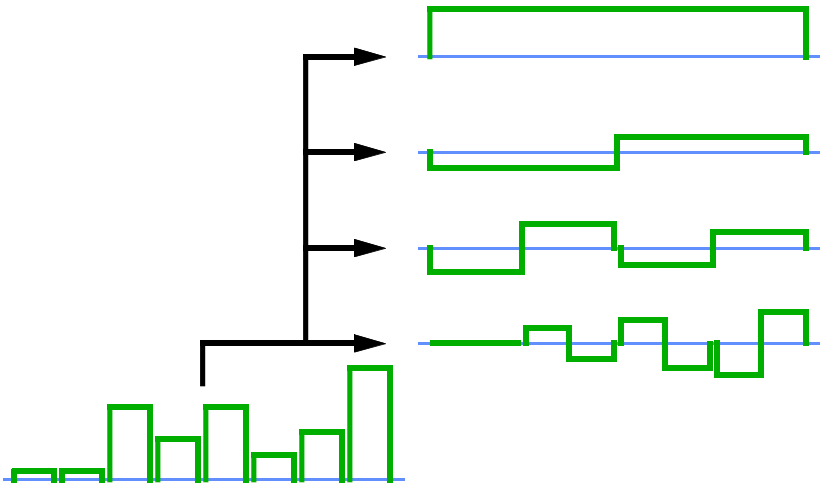
Haar Transform



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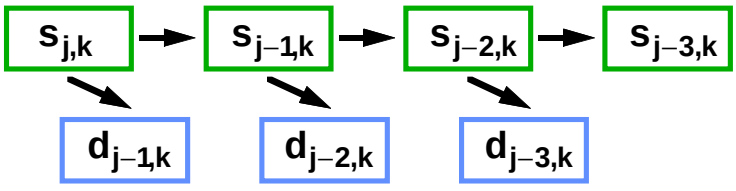
Haar Transform

Pyramid transform

- pass from samples to averages and differences
- linear time: 2n + n + n/2 + n/4 + n/8 + … = 4n
- easy to invert



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Haar Basis

Change of Basis

- Box basis to Haar basis
- Scaling functions:

$$\varphi_{j,k}(x) = \varphi\left(2^j x - k\right)$$

- Wavelets:

$$\psi_{j,k}(x) = \psi\left(2^j x - k\right)$$

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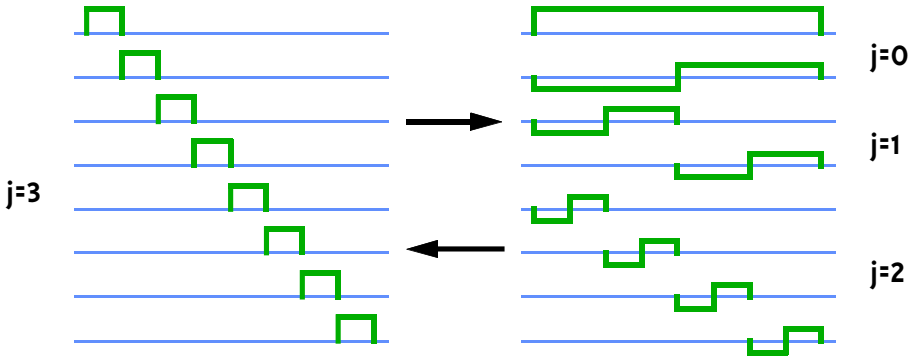
Haar Basis

Change of Basis



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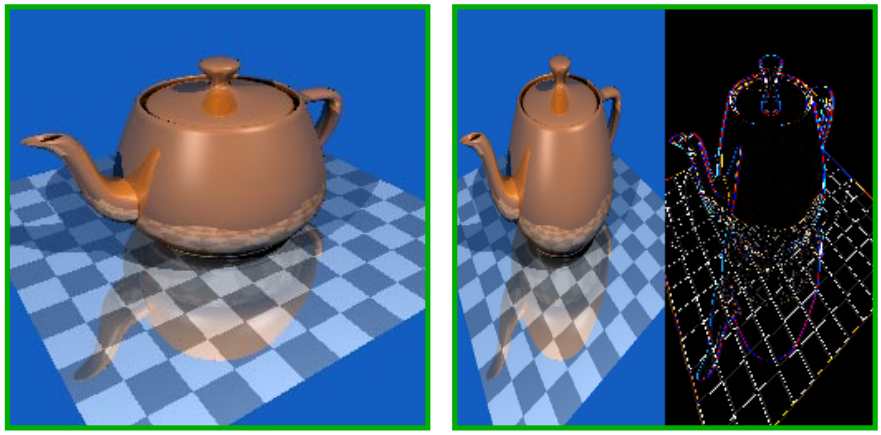
Transforming the Image



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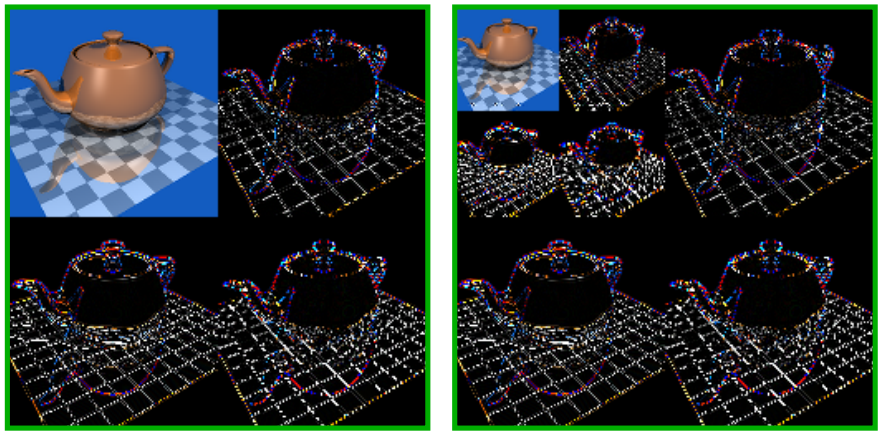
Transforming the Image



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