

Wavelet Transform for Image Processing

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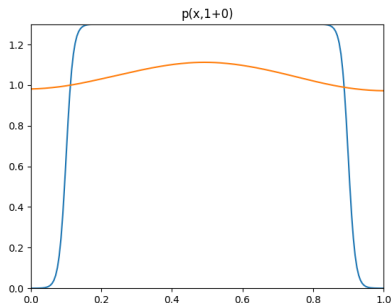
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Pre

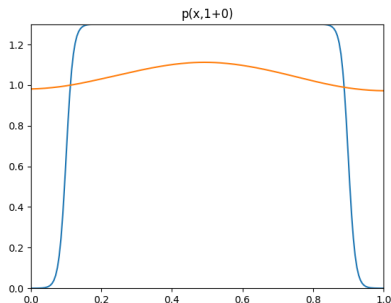
To transform a image into $2^N \times 2^N$



sadfsa

Pre

To transform a image into $2^N \times 2^N$



sadfsa
sdfas

$$E = mc^2$$

sadf

- sadf

sadf

- sadf
- sadf

sadf

- sadf
- sadf
- sdgas

Basic Idea

Vector decomposition.

Standard Haar Decomposition

- sdlfkj
- sDF
- sdf

sdfg

- sdlfkj
- sDF
- sdf

sadsgkjh

- sdIfkj
- sDF
- sdf

sdf

- sdfkj
- sDF
- sdf

Basic Idea

$$\sum_{k=1}^n \hat{l}_k^4 \leq \left(\sum_{k=1}^n \hat{l}_k^2 \right)^2 = \left(\sum_{k=1}^n l_k^2 \right)^2$$

$$\min_{\hat{l}_k \in l^2 \text{ st. } \sum_{k=1}^n \hat{l}_k^2 = \sum_{k=1}^n l_k^2} \left(- \sum_{k=1}^n \hat{l}_k^4 \right)$$

Basic Idea

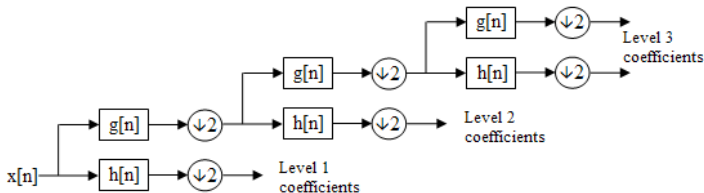


Figure: Cascading

$$\min_{\Phi} \left(- \sum_{k=1}^n \hat{l}_k^4 \right)$$

- Condense the energy to as less coefficients as possible.

Results

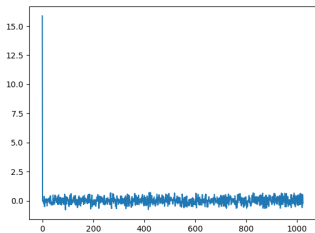


Figure: Haar 2x2 filter bank random input. Compression Rate 0.2568

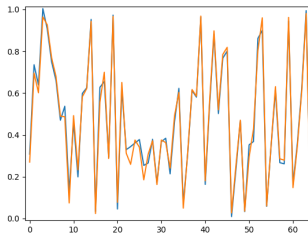


Figure: Haar 2x2 filter bank random input. Total average energy loss 0.0009

- random sequence would take more information entropy so have a low compress rate.

Results

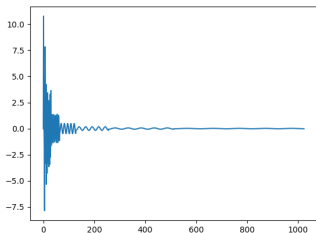


Figure: Haar 2x2 filter bank sin input frequency. Compression Rate 0.9287

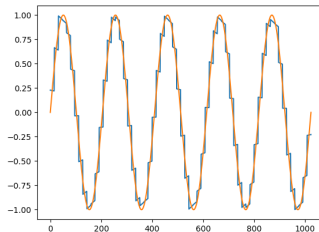


Figure: Haar 2x2 filter bank sin input reconstruction. Total average energy loss 0.0104

- a smooth signal not have much information entropy, so will have a high compress rate.

Results

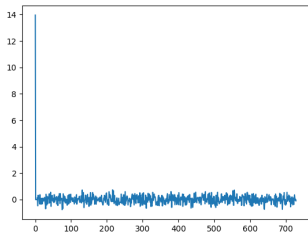


Figure: Haar 3x3 filter bank random input. Compression Rate 0.1906

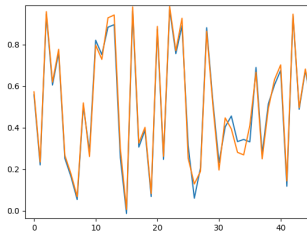


Figure: Haar 3x3 filter bank random input. Total average energy loss 0.0008

- same random sequence same reason.

Results

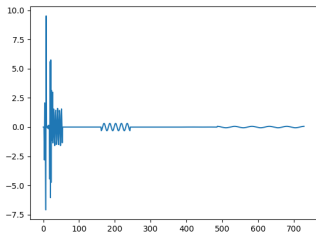


Figure: Haar 3x3 filter bank sin input frequency. Compression Rate 0.7750

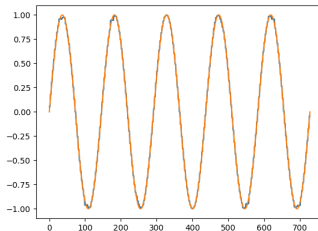


Figure: Haar 3x3 filter bank sin input reconstruction. Total average energy loss 0.0007

- same smooth signal same reason.

sadsgkjh

- sdIfkj
- sDF
- sdf

sdf

- sdlfkj
- sDF
- sdf