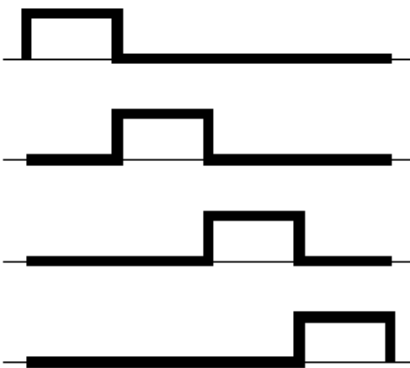


Wavelets

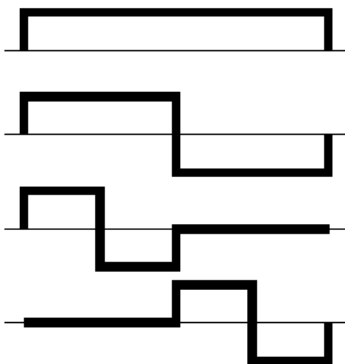
do the wave!

Os

Change the base

$$\begin{aligned} \mathcal{I}(x) &= 9 \times \text{[step function 1]} \\ &+ 7 \times \text{[step function 2]} \\ &+ 3 \times \text{[step function 3]} \\ &+ 5 \times \text{[step function 4]} \end{aligned}$$


$$\mathcal{I}(x) = c_0^0 \phi_0^0(x) + d_0^0 \psi_0^0(x) + d_0^1 \psi_0^1(x) + d_1^1 \psi_1^1(x)$$

$$\begin{aligned} &= 6 \times \text{[wide positive pulse]} \\ &+ 2 \times \text{[positive pulse]} \\ &+ 1 \times \text{[positive pulse]} \\ &+ -1 \times \text{[negative pulse]} \end{aligned}$$


The math behind

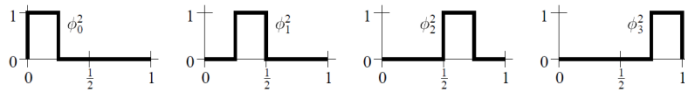


Figure 2 The box basis for P^2 .

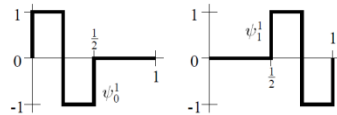


Figure 3 The Haar wavelets for H^1 .

$$\phi\psi_{k\ell}^j(x, y) := 2^j \phi\psi(2^j x - k, 2^j y - \ell)$$

$$\psi\phi_{k\ell}^j(x, y) := 2^j \psi\phi(2^j x - k, 2^j y - \ell)$$

$$\psi\psi_{k\ell}^j(x, y) := 2^j \psi\psi(2^j x - k, 2^j y - \ell).$$



16 out of 16 coefficients



14 out of 16 coefficients



12 out of 16 coefficients



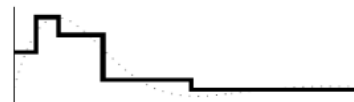
10 out of 16 coefficients



8 out of 16 coefficients



6 out of 16 coefficients



4 out of 16 coefficients



2 out of 16 coefficients

Algorithm

procedure *DecompositionStep*(*C*: array [1..*h*] of reals)

for *i* \leftarrow 1 **to** *h*/2 **do**

$C'[i] \leftarrow (C[2i - 1] + C[2i])/\sqrt{2}$

$C'[h/2 + i] \leftarrow (C[2i - 1] - C[2i])/\sqrt{2}$

end for

$C \leftarrow C'$

end procedure

procedure *Decomposition*(*C*: array [1..*h*] of reals)

$C \leftarrow C/\sqrt{h}$ (*normalize input coefficients*)

while *h* > 1 **do**

DecompositionStep(*C*[1..*h*])

$h \leftarrow h/2$

end while

end procedure



transform rows

transform
columns



⋮



procedure *StandardDecomposition*(*C*: **array** [$1..h, 1..w$] **of** **reals**)

for *row* $\leftarrow 1$ **to** *h* **do**

Decomposition(*C*[*row*, $1..w$])

end for

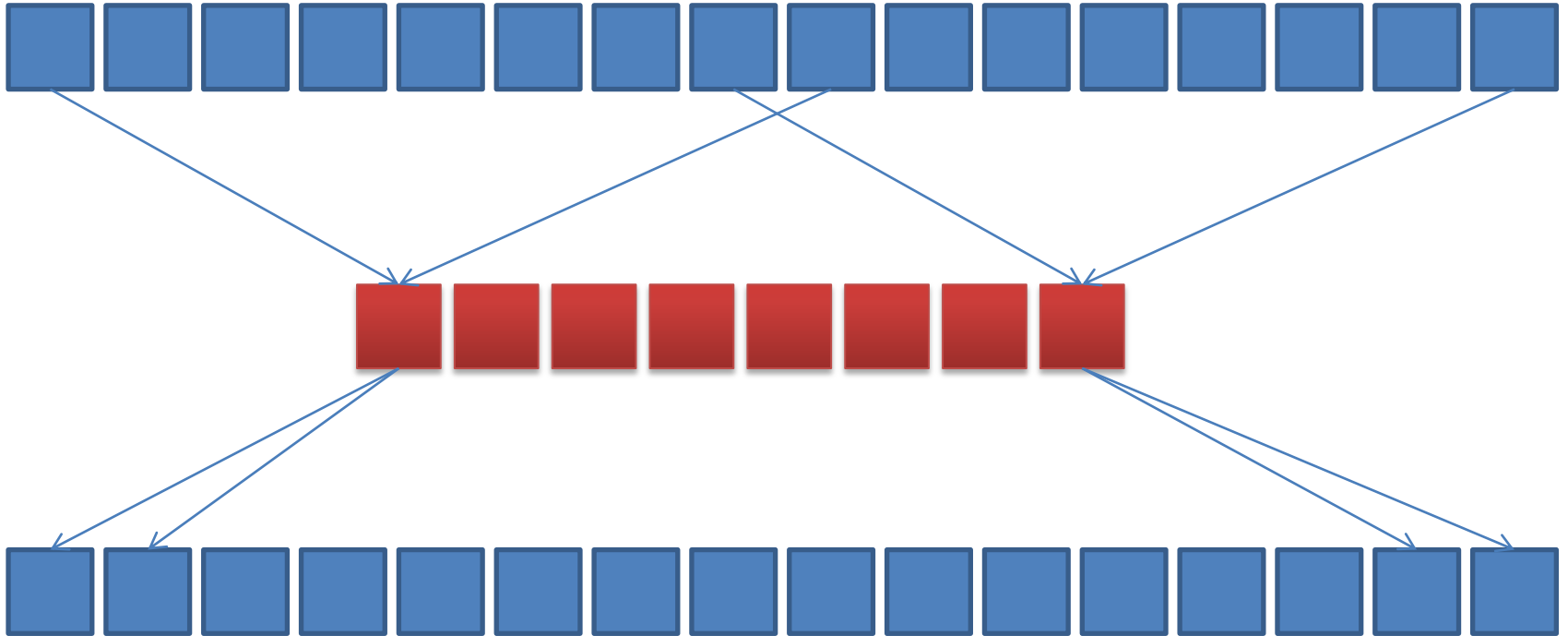
for *col* $\leftarrow 1$ **to** *w* **do**

Decomposition(*C*[$1..h$, *col*])

end for

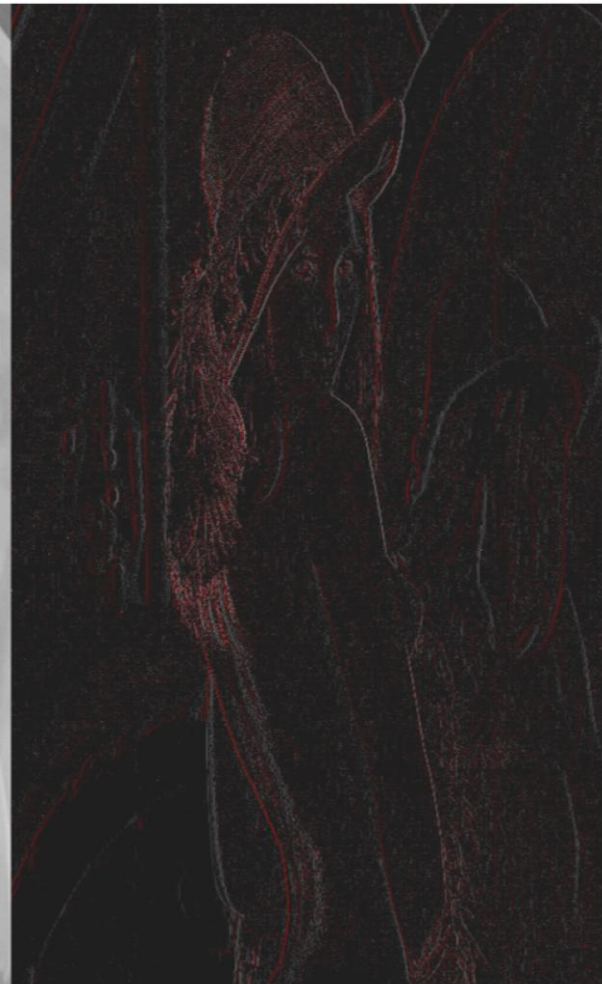
end procedure

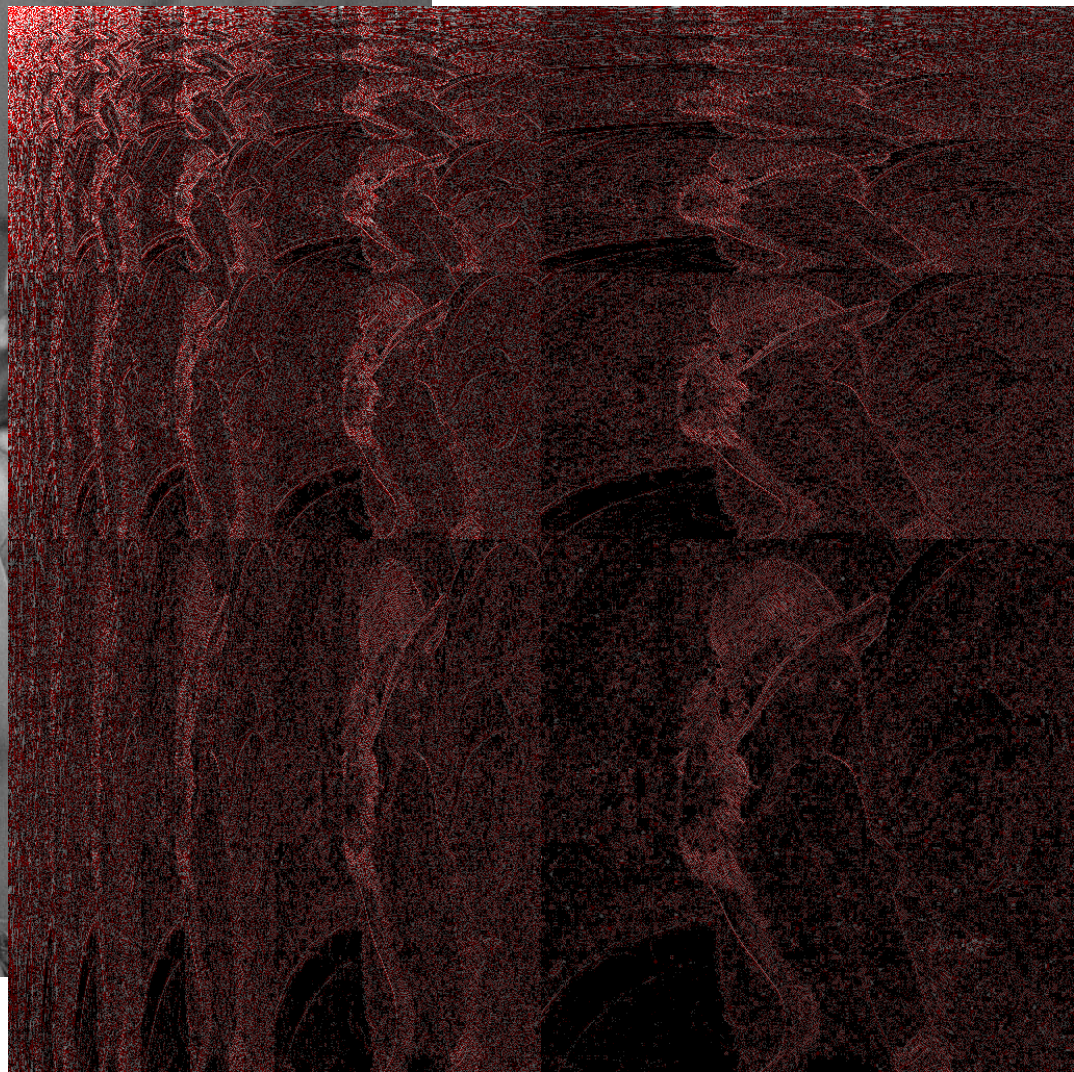
Implementation

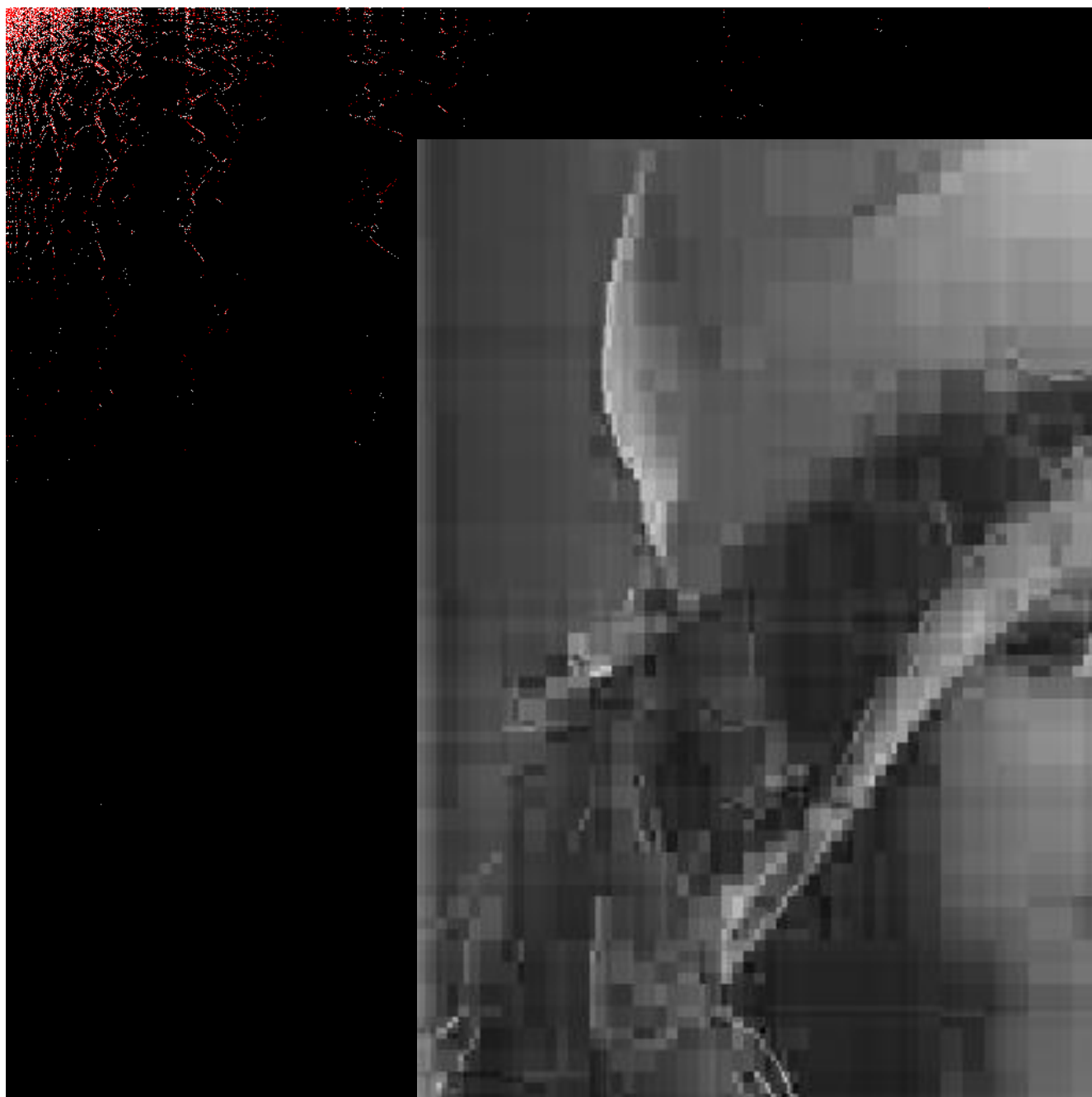


`__syncthreads()`

Visual







■ SMEM+TEX : Device_0 : Context_0
■ ShareMEM : Device_0 : Context_0

Comparison Summary Plot

