

$$S = \begin{pmatrix} 4 & 2 & 3 & 5 \\ 1 & -7 & 0 & 8 \\ -1 & -3 & 9 & -3 \\ 6 & -2 & -1 & 1 \end{pmatrix}$$

Dim2 ↑
↓ Dim1

High-pass Filters:

$$H_1 = \frac{1}{2} [1 \quad -1]$$

$$H_2 = \frac{1}{2} \begin{bmatrix} 1 & -1 & 0 & 0 \\ 0 & 0 & 1 & -1 \end{bmatrix}$$

Low-pass Filters:

$$L_1 = \frac{1}{2} [1 \quad 1]$$

$$L_2 = \frac{1}{2} \begin{bmatrix} 1 & 1 & 0 & 0 \\ 0 & 0 & 1 & 1 \end{bmatrix}$$

Step 0: $cc2 = S$

Step 1: Apply H_2 on $cc2$ Dim1 (every row):

$$\begin{pmatrix} 1 & -1 \\ 3 & -4 \\ 1 & 6 \\ 4 & -1 \end{pmatrix}$$

H_2 on Dim2
(every column)

$$\begin{pmatrix} -1 & \frac{3}{2} \\ -\frac{3}{2} & \frac{7}{2} \end{pmatrix}$$

dd2

L_2 on Dim2
(every column)

$$\begin{pmatrix} 2 & -\frac{5}{2} \\ \frac{5}{2} & \frac{5}{2} \end{pmatrix}$$

dc2

Apply L_2 on $cc2$ Dim1 (every row):

$$\begin{pmatrix} 3 & 4 \\ -3 & 4 \\ -2 & 3 \\ 2 & 0 \end{pmatrix}$$

L_2 on Dim2
(every column)

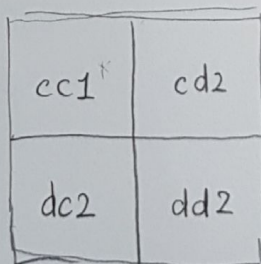
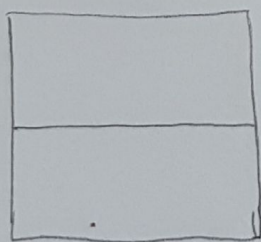
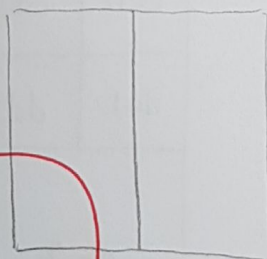
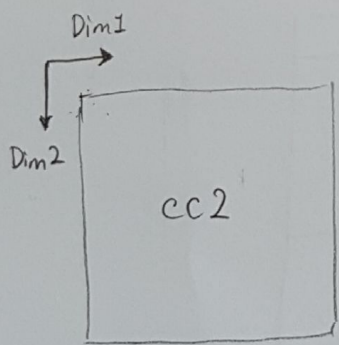
$$\begin{pmatrix} 0 & 4 \\ 0 & \frac{3}{2} \end{pmatrix}$$

cc1

H_2 on Dim2
(every column)

$$\begin{pmatrix} 3 & 0 \\ -2 & \frac{3}{2} \end{pmatrix}$$

cd2



Step 2:

cc1

$$\begin{pmatrix} 0 & 4 \\ 0 & \frac{3}{2} \end{pmatrix}$$

Dim2
↑
Dim1

H₁ on Dim1

$$\begin{pmatrix} -2 \\ -\frac{3}{4} \end{pmatrix}$$

H₁ on Dim2 → **dd1**
 $\left(-\frac{5}{8}\right)$

L₁ on Dim2 → **dc1**
 $\left(-\frac{11}{8}\right)$

L₁ on Dim1

$$\begin{pmatrix} 2 \\ \frac{3}{4} \end{pmatrix}$$

L₁ on Dim2 → **cc0**
 $\left(\frac{11}{8}\right)$

H₁ on Dim2 → **cd1**
 $\left(\frac{5}{8}\right)$

Output: $d =$

cc0	cd1	cd2
dc1	dd1	
dc2		dd2