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Negative $\Rightarrow (L-1-r)$

$$\begin{matrix} 0 & 7 & 3 & 1 \\ 3 & 6 & 4 & 6 \\ 2 & 4 & 2 & 2 \\ 1 & 2 & 5 & 3 \end{matrix} \Longrightarrow \begin{matrix} 7 & 0 & 4 & 6 \\ 4 & 1 & 3 & 1 \\ 5 & 3 & 5 & 5 \\ 6 & 5 & 2 & 4 \end{matrix}$$

$[L = 8]$

[Note : per pixel = r]

Thresholding $\Rightarrow S = \begin{cases} (L-1) ; r \geq 4 \\ 0 ; r < 4 \end{cases}$

$$\begin{matrix} 0 & 7 & 3 & 1 \\ 3 & 6 & 4 & 6 \\ 2 & 4 & 2 & 2 \\ 1 & 2 & 5 & 3 \end{matrix} \Longrightarrow \begin{matrix} 0 & 7 & 0 & 0 \\ 0 & 7 & 7 & 7 \\ 0 & 7 & 0 & 0 \\ 0 & 0 & 7 & 0 \end{matrix}$$

Clipping $\Rightarrow \begin{cases} Y_1 = 2 , Y_2 = 5 \\ (L-1) ; 2 \leq r \leq 5 \\ 0 ; \text{otherwise} \end{cases}$

$$\begin{matrix} 0 & 7 & 3 & 1 \\ 3 & 6 & 4 & 6 \\ 2 & 4 & 2 & 2 \\ 1 & 2 & 5 & 3 \end{matrix} \Longrightarrow \begin{matrix} 0 & 0 & 7 & 0 \\ 7 & 0 & 7 & 0 \\ 7 & 7 & 7 & 7 \\ 0 & 7 & 7 & 7 \end{matrix}$$

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Bit plan Slicing

$$\begin{matrix} 7 & 6 & 5 \\ 4 & 3 & 2 \\ 1 & 0 & 7 \end{matrix} \Longrightarrow \begin{matrix} 111 & 110 & 101 \\ 100 & 011 & 010 \\ 001 & 000 & 111 \end{matrix}$$

M C L

MSB	centre	LSB
1 1 1	1 1 0	1 0 1
1 0 0	0 1 1	0 1 0
0 0 1	0 1 1	1 0 1

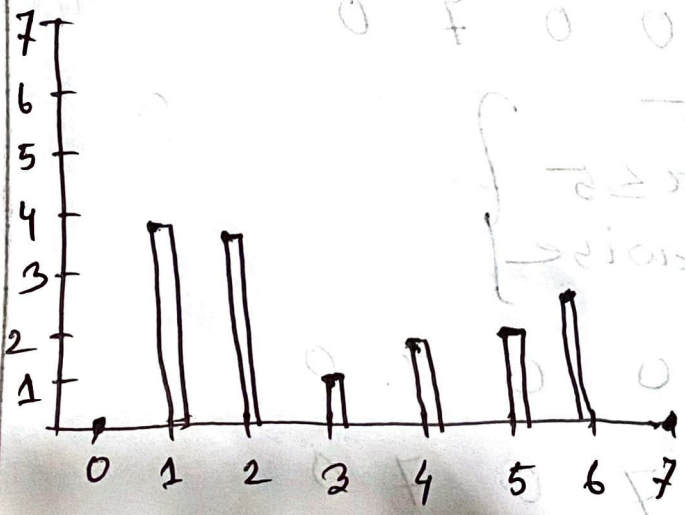
Contrast streteching ⟹

$$\begin{matrix} 2 & 1 & 2 & 1 \\ 4 & 5 & 5 & 6 \\ 3 & 2 & 1 & 4 \\ 6 & 2 & 1 & 6 \end{matrix}$$

[∵ per pixel = m]

$l = 0, 1, 2, 3, 4, 5, 6, 7$

$n = 0, 4, 4, 1, 2, 2, 3, 0$



∴ Here, $l_{min} = 0$, $l_{max} = 7$

$M_{min} = 1$, $M_{max} = 6$

$$\therefore l = \frac{(l_{max} - l_{min})(m - M_{in})}{(m_{max} - m_{in})} + l_{min}$$

$$= \frac{(7-0)(m-1)}{6-1} + 0$$

$$= \frac{7(m-1)}{5}$$

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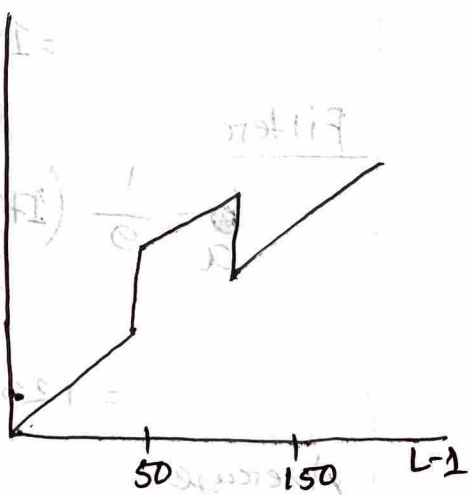
Histogram

r_k	n_k	PDF (n_k/n)	CDF (P.V.t n.v)	CDF×7	S_k (Under 5 i.s P.V; Above 5 i.s n.v)	new n_k
0	80	0.20	0.20	1.4	1	80
1	100	0.25	0.45	3.15	3	100
2	90	0.23	0.68	4.76	5	90
3	60	0.15	0.83	5.81	6	60 + 30 → 90
4	30	0.7	0.90	6.3	6	
5	20	0.05	0.95	6.65	7	20 + 10 + 0 → 30
6	10	0.02	0.97	6.79	7	
7	0	0	0.97	6.79	7	

$n = 390$

Another clipping Math

$$f(x) = \begin{matrix} 100 & 170 & 130 & 210 \\ 157 & 66 & 40 & 60 \\ 52 & 50 & 200 & 20 \\ 100 & 120 & 150 & 155 \end{matrix}$$



Apply this on the f(x,y) image segment

Result:

$$\begin{matrix} 255 & 0 & 255 & 0 \\ 0 & 255 & 0 & 255 \\ 255 & 255 & 0 & 0 \\ 255 & 255 & 255 & 0 \end{matrix}$$

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Image Enhancement

2nd one

145	55	37	20
10-a	170-b	131-c	70
175-d	180-e	210-f	200
239	155 h	100-i	323

1st one

3rd one

Kernal

0	-1	0
-1	5	-1
0	-1	0

Neighborhood

$f_{processed} = 5\times210 + 170\times0 + 131\times(-1) + 70\times0 + 180\times(-1) + 200\times(-1) + 155\times0 + 100\times(-1) + 323\times0$

$= 1020 + 0 - 131 + 0 - 180 - 200 + 0 - 100 + 0$

$= 409$

$e_{processed} = 5\times180 + 10\times0 + 170\times(-1) + 131\times0 + 175\times(-1) + 210\times(-1) + 23\times0 + 155\times(-1) + 100\times0$

$= 190$

Filter

$\frac{b}{a} = \frac{1}{9}(170\times1 + 145\times1 + 55\times1 + 37\times1 + 10\times1 + 131\times1 + 175\times1 + 180\times1 + 210\times1)$

$= 1230 \text{ or } 124$

Average Weighted Filter

$f = \frac{1}{16}(200\times4 + 70\times2 + 210\times2 + 323\times2 + 131\times1 + 100\times1)$

$= 139 \text{ or } 140$

[Note : Kernal মুখস্থ করতে হবে]