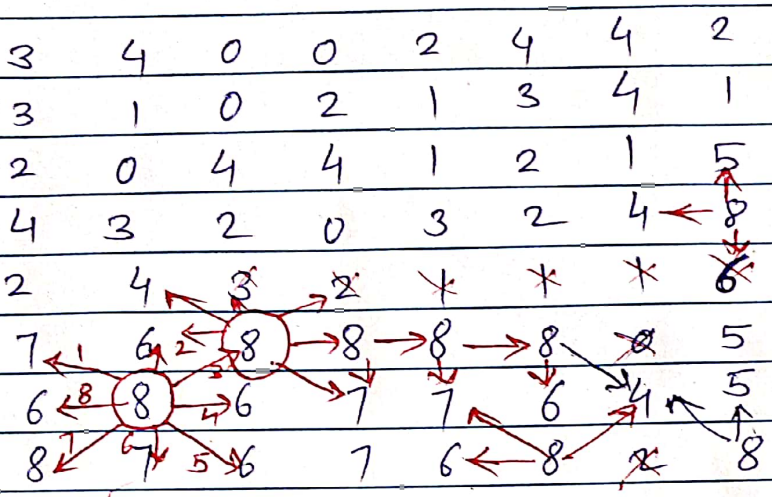
1. For the image shown below, make two segments using region growing method.



Soln:- Seed value = 8 ..... max intensity value.

Threshold value $= \frac{8-0}{2} = 4$

To make segment check deviation from particular seed value as

δ = Seed value − Pixel value.

Let assume seed value = 8

Threshold V = 4

So deviation should be less than or equal to 4.

Considering image, start checking from (8) as for first 8.

1. $\delta = 8-7 = 1$ ..... ≤ 4
2. $\delta = 8-6 = 2$ ..... ≤ 4
3. $\delta = 8-8 = 0$
4. $\delta = 8-6 = 2$
5. $\delta = 8-6 = 2$
6. $\delta = 8-7 = 1$

(7) $\delta = 8-8 = 0$

(8) $\delta = 8-6 = 2$

So all value are region growing for next (8) find by previous.

Consider the values comes less than 4 as '1' & other as '0'.
So, we find that as.

0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	1
0	1	0	0	0	0	0
1	1	1	1	1	0	0
1	1	1	1	1	1	1
1	1	1	0	1	0	1

The image is in two segments according to pixel.

2. Calculate the performance index for translation (2,2) for the image & template shown in fig.

Image.

x ↓ / y →	1	2	3	4	5	6	7
1	3	5	9	0	1	2	5
2	9	6	6	5	9	3	2
3	2	1	2	7	5	3	1
4	9	8	2	5	7	1	4
5	6	3	4	4	3	6	6
6	7	3	2	9	2	5	2
7	7	1	7	5	7	9	4

Template.

9	2	8	5
3	6	7	3
0	9	9	8
7	9	1	5

Soln.

x ↓ / y →	0	1	2	3	4	5	6
0	3	5	9	0	1	2	5
1	9	6	6	5	9	3	2
2	2	1	2	7	5	3	1
3	9	8	2	5	7	1	4
4	6	3	4	4	3	6	6
5	7	3	2	9	2	5	2
6	7	1	7	5	7	9	4

Performance image (2 X 2)

2	7	5	3
2	5	7	1
4	4	3	6
2	9	2	5

Template.

9	2	8	5
3	6	7	3
0	9	9	8
7	9	1	5

Performance index = Σ (Performance image − Template)

+7	5	+3	+2	= 17
+1	+1	0	+2	= 4
4	+5	+6	+2	= 17
+5	0	1	0	= 6

Σ sum = 17 + 4 + 17 + 6

= 44

Performance index = 44

Q. 3. Determine the x & y co-ordinate of the centroid of the gray scale image shown in Fig. below.

2	0	1	0
1	0	1	2
0	0	3	0
4	1	2	0

Soln

x coordinate of centroid

x ↓ / y →	1	2	3	4
1	2	0	1	0
2	1	0	1	2
3	0	0	3	0
4	4	1	2	0

Now, Moment = intensity x distance.

1) Moment about $x = M_x$

M_x = Pixel intensity x distance from origin.

Multiply each row with same distances of

Row 1x1 Row 2x2 Row 3x3 Row 4x4

So,

M_x =	2	0	1	0
	2	0	2	4
	0	0	9	0
	16	4	8	0

2] III^rd for my multiply column with repeat distance
Column 1x1 Column 2x2 Column 3x3 Column 4x4

$$My = \begin{matrix} 2 & 0 & 3 & 0 \\ 1 & 0 & 3 & 8 \\ 0 & 0 & 9 & 0 \\ 4 & 2 & 6 & 0 \end{matrix}$$

3] For M_{00}

$$M_{00} = \sum Mx^0 My^0$$

As something to power zero is 1
so.

$$\begin{matrix} 1 & 0 & 1 & 0 \\ 1 & 0 & 1 & 1 \\ 0 & 0 & 1 & 0 \\ 1 & 1 & 1 & 0 \end{matrix}$$

$M_{00} = 1+1+1+1+1+1+1+1+1 = 9$

4] For M_{10}

$$M_{10} = \sum Mx^1 My^0$$

$$\begin{matrix} 2 & 0 & 1 & 0 & = 3 \\ 2 & 0 & 2 & 4 & = 8 \\ 0 & 0 & 9 & 0 & = 9 \\ 16 & 4 & 8 & 0 & = 28 \end{matrix}$$

$M_{10} = 3+8+9+28 = 48$

5] For M_{01}

$$M_{01} = \sum m_x^0 m_y^1$$

2	0	3	0	= 5
1	0	3	8	= 12
0	0	9	0	= 9
4	2	6	0	= 12

$$M_{01} = 5 + 12 + 9 + 12$$
$$= 38$$

$$\bar{x} \text{ co-ordinate} = \frac{M_{10}}{M_{00}} = \frac{48}{9} = 5.33$$

$$\bar{y} \text{ coordinate} = \frac{M_{01}}{M_{00}} = \frac{38}{9} = 4.22$$

Q.4. Determine the gradient of intensity of a pixel having intensity 7 in the image given below use Prewitt operator.

4	6	5
3	7	8
2	9	1

Soln →

Gradient of intensity

image

4	6	5
3	7	8
2	9	1

For Prewitt operator consider $\tau = 1$

$M_x =$

-1	0	1
-1	0	1
-1	0	1

$M_y =$

-1	-1	-1
0	0	0
1	1	1

1) $M_1 = \text{image} \times M_x$

$=$

-4	0	5
-3	0	8
-2	0	1

$$g_x = \frac{|(5-4)+(8-3)+(1-2)|}{3}$$

$$= \frac{|1+5+1|}{3} = \frac{7}{3} = 2.33$$

2) M_2 = image X My

$$\begin{matrix} -4 & -6 & -5 \\ 0 & 0 & 0 \\ 2 & 9 & 1 \end{matrix}$$

$$Fy = \frac{(2-4)+(9-6)+(1-5)}{3}$$

$$= \frac{2+3+4}{3} = 9/3 = 3$$

Gradient intensity of image

$$\overline{VF} = \sqrt{Fx^2 + Fy^2}$$

$$= \sqrt{(2.33)^2 + (3)^2}$$

$$\boxed{VF = 3.79}$$