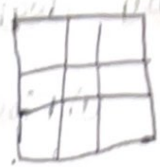
Quiz-2

① $$\begin{bmatrix} 18 & 22 & 33 & 25 & 32 & 24 \\ 34 & 128 & 24 & 172 & 28 & 23 \\ 22 & 19 & 32 & 31 & 28 & 26 \end{bmatrix}$$



filter

$$\begin{matrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 18 & 22 & 33 & 25 & 32 & 24 & 0 \\ 0 & 34 & 128 & 24 & 172 & 26 & 23 & 0 \\ 0 & 22 & 19 & 32 & 31 & 28 & 26 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{matrix}$$

calculate median (0,0,0,0,0,18,22,34,128)

$$\begin{bmatrix} 0 & 18 & 22 & 24 & 23 & 0 \\ 18 & 18 & 19 & 24 & 23 & 23 \\ 0 & 19 & 19 & 24 & 23 & 0 \end{bmatrix}$$

2) Conditions for region splitting and meaging

1) Split into foua disjoint quadrants any region R_i for which $Q(R_i) = \text{FALSE}$

2) when no fuather splitting is possible, meage any adjacent regions R_j and R_k for which

$Q(R_j \cup R_k) = \text{TRUE}$

3) Stop when no fuather meaging is possible

3) No, if all the pixels in an image are shuffled, there will be no change in the histogram. Since we take how many times a same pixel value appeaas the values remains same.

4) Abrupt local changes in intensities are detected by derivaties.

① First order derivate [produce thicker edge]

$$\frac{\partial f}{\partial x} = f(x+1) - f(x)$$

② second order derivative [stronger, responce to fine detail]

$$\frac{\partial^2 f}{\partial x^2} = f(x+1) + f(x-1) - 2f(x)$$

For 2D Edge detections derivatives are

1) 1st order

$$\nabla f(x,y) = \frac{\partial f}{\partial x} + \frac{\partial f}{\partial y}$$

$$\frac{\partial f}{\partial x} = f(x+1, y) - f(x,y)$$

$$\frac{\partial f}{\partial y} = f(x, y+1) - f(x,y)$$

5) Yes, chain code compresses the discription information of an object contour by representing the contour as sequence of directional codes, where each code corresponds to the direction of successive contour points.

6) 1) Medical imaging

2) Facial Recoginisation

3) Finger point Recoginisatio

4) Object detection

2) Canny - Edge Detection :-

Three objectives
1) Low Error rate
2) Edge points should be well localized
3) single edge point responce

Basic Steps

1) smooth the input image with guassian filter.

$$G(x,y) = e^{-\frac{x^2+y^2}{2\sigma^2}}$$

$$f_s(x,y) = G(x,y) * f(x,y)$$

2) compute the gradient magnitude and angle images

Gradient image

$$M(x,y) = \sqrt{g_x^2+g_y^2}.$$

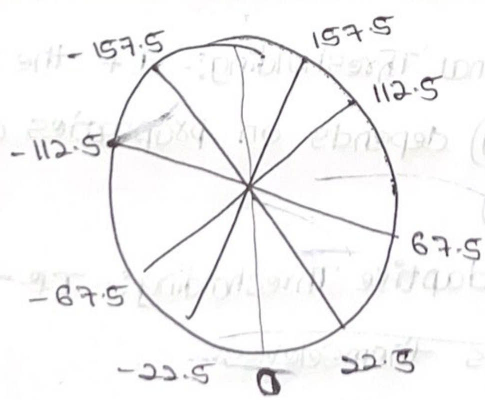
Gradient angle

$$\alpha(x,y) = \tan^{-1}\left(\frac{g_y}{g_x}\right)$$

$$g_x = \frac{\partial f_s}{\partial x}$$

$$g_y = \frac{\partial f_y}{\partial x}$$

3) Apply nonmaxima suppression to the gradient magnitude image



→ Let d_1, d_2, d_3, d_4 denote 4 directions : horizontal, $-45°$, vertical, $+45°$

→ Find the direction d that is closet to $\alpha(x,y)$

4) Use double thresholding and connectivity analysis to detect and link Edges

$$g_{NH}(x,y) = g_N(x,y) \geq T_H$$

$$g_{NL}(x,y) = g_N(x,y) \geq T_L$$

8) $f = \{0,0,0,1,0,0,0\}$

$w = \{1,2,3,2,8\}$

convolution — $\{8,2,3,2,1\}$ (rotate 180°)

f= By padding 2-zeros

1 ⇒ {0,0,0,0,0,1,0,0,0,0,0

8 | 2 | 3 | 2 | 1

applying filter

$8*0 + 2*0 + 3*0 + 2*0 + 1*0 = 0$

2 ⇒ 0 0 0 0 0 1 0 0 0 0 0

8 2 3 2 1

applying filter = 1

3 ⇒ 00000100000

82321

applying filter = 2

4 ⇒ 00000100000

82321 ⇒ 3

5 ⇒ 00000100000

8232100 ⇒ 2

6 ⇒ 00000100000 ⇒ 8

82321

7 ⇒ 00000100000

82321 ⇒ 0

8 ⇒ 00000

Final convolution result

0123280.

9)

$$\begin{bmatrix} 24 & 22 & 33 & 25 & 32 & 24 \\ 34 & 255 & 24 & 0 & 26 & 23 \\ 23 & 21 & 32 & 31 & 28 & 26 \end{bmatrix}$$

$$\begin{matrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ 0 & 24 & 22 & 33 & 25 & 32 & 24 & 0 \\ 0 & 34 & 255 & 24 & 0 & 26 & 23 & 0 \\ 0 & 23 & 21 & 32 & 31 & 28 & 26 & 0 \\ 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \end{matrix}$$

Applying 3X3 median filter

median

$$\begin{bmatrix} 0 & 22 & 0 & 0 & 0 & 0 \\ 21 & 21 & 24 & 26 & 25 & 23 \\ 0 & 21 & 0 & 0 & 0 & 0 \end{bmatrix}$$

By applying median filter all the intensity values are nearer to each other reducing the salt and pepper noice

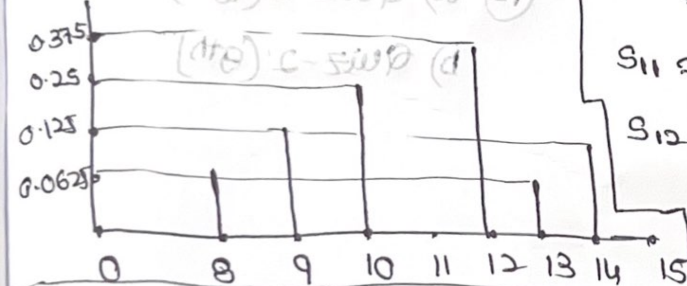
10)

$$\begin{bmatrix} 10 & 12 & 8 & 9 \\ 10 & 12 & \cancel{12} & 14 \\ 12 & 13 & 10 & 9 \\ 14 & 12 & 10 & 12 \end{bmatrix}$$

Highest intensity - 14 requires 4 bits to represent so intensity. Value lies in range 0, 15

r_k	n_k	$P_r(r_k)$
0	0	0
1	0	0
2	0	0
3	0	0
4	0	0
5	0	0
6	0	0
7	0	0
8	1	1/16 = 0.0625
9	2	2/16 = 0.125
10	4	4/16 = 0.25
11	0	0
12	6	6/16 = 0.375
13	1	0.0625
14	2	0.125
15	0	0

Histogram for input



For equilization

$$S_K = \sum_{K=0}^{K} (L-1)\, P_r(r_K)$$

$$\Rightarrow (L-1) \sum_{K=0}^{K} P_r(r_K)$$

$S_0 \Rightarrow 15 * P_0 \Rightarrow 0$

Similary $S_1, S_2, S_3, S_4, S_5, S_6, S_7 \Rightarrow 0$

$S_8 = 15 * [P_0 + P_1 + P_2 + \cdots P_8]$

$= 15 * [0 + 0.0625] = 0.9375 \approx 1$

$S_9 = 15 * [P_0 + P_1 + \cdots P_9]$

$= 15 * [0 + 0.0625 + 0.125]$

$= 2.8125 \approx 3$

$S_{10} = 15 * [0 + 0.0625 + 0.125 + 0.25]$

$= 6.5625 \approx 7$

$S_{11} \approx S_{10} = 7.$

$S_{12} = 15 * [0 + 0.0625 + 0.125 + 0.25 + 0.375]$

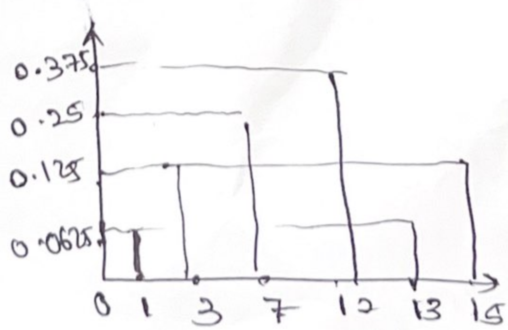
$= 12.1875 \approx 12$

$S_{13} = 13.125 \approx 13$

$S_{14} = 15.$

$S_{15} = 15.$

S_k	n_k	$P_r(S_k)$
0	0	0
1	1	0.0625
2	0	0
3	2	0.125
4	0	0
5	0	0
6	0	0
7	4	0.25
8	0	0
9	0	0
10	0	0
11	0	0
12	6	0.375
13	1	0.0625
14	0	0
15	2	0.125



Internal-1

(1) Quiz-1 (1st)

(2) Quiz-1 (5th)

(3) Quiz-1 (4th)

(4) Quiz-2 (1st)

(5) Quiz-2 (2nd)

(6) Quiz-2 (3rd)

(7) Quiz-1 (9th)

(8) Quiz-1 (3rd)

(9) Quiz-2 (9th)

(10) Quiz-2 (7th)

(11) a) Unit-1 (Part-1)

b) Quiz-1 (7th)

(12) a) Quiz-2 (10th)

b) Quiz-2 (8th)