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Assgn 4

Q.1 $F = \begin{bmatrix} 6 & 5 & 10 \\ 100 & 100 & 100 \\ 4 & 20 & 10 \end{bmatrix}$

$F = \begin{bmatrix} 6 & 6 & 5 & 10 & 10 \\ 6 & 6 & 5 & 10 & 10 \\ 100 & 100 & 100 & 100 & 100 \\ 4 & 4 & 20 & 10 & 10 \\ 4 & 4 & 20 & 10 & 10 \end{bmatrix}$

Horizontal line

$\begin{bmatrix} -1 & -1 & -1 \\ 2 & 2 & 2 \\ -1 & -1 & -1 \end{bmatrix}$

Vertical line

$\begin{bmatrix} -1 & 2 & -1 \\ -1 & 2 & -1 \\ -1 & 2 & -1 \end{bmatrix}$

$A = \begin{bmatrix} -283 & -279 & -275 \\ 555 & 541 & 531 \\ -272 & -266 & -269 \end{bmatrix}$

$A = \begin{bmatrix} 122 & -12 & 10 \\ -15 & 20 & -5 \\ -32 & 52 & -20 \end{bmatrix}$

Q.2 $F = \begin{bmatrix} 50 & 60 & 70 \\ 5 & 50 & 80 \\ 7 & 9 & 50 \end{bmatrix}$

Prewitt's filter

$G_x = \begin{bmatrix} -1 & 0 & 1 \\ -1 & 0 & 1 \\ -1 & 0 & 1 \end{bmatrix}$ $G_y = \begin{bmatrix} 1 & 1 & 1 \\ 0 & 0 & 0 \\ -1 & -1 & -1 \end{bmatrix}$

For $f(x,y) = 50$

$A_x = 138$ $\quad$ $A_y = 114$

$$\alpha = \tan^{-1}\left(\frac{114}{138}\right) = 39.56^\circ$$

Q.3 $F = \begin{vmatrix} 1 & 6 & 5 \\ 0 & 7 & 6 \\ 3 & 1 & 7 \end{vmatrix}$ $\quad$ $I_{max} = 7$

A ↓ B

$\cos(A,B) = I_{max} - |A-B|$

① Edge 1

1 C1	6	5	$C1 = 7 - \|1-6\| = 7-5 = 2$
0 C2	7	6	$C2 = 7 - \|7-0\| = 7-7 = 0$
3 C3	1	7	$C3 = 7 - \|3-1\| = 7-2 = 5$

$cost(E1) = 7$

② Edge 2

1	C1	6	7	$C1 = 7 - \|6-1\| = 7-5 = 2$
0	C2 7 C3		6	$C2 = 7 - \|7-6\| = 7-1 = 6$
3	1	C4	7	$C3 = 7 - \|7-6\| = 7-1 = 6$
				$C4 = 7 - \|7-1\| = 7-6 = 1$

$cost(E2) = 15$

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③ Edge 3

1	c1	6	7
0	c2	7	6
3	c3	c4	7

Cost(E3) = (7-5) + (7-7) + (7-6)
= 2 + 0 + 1 + 1
= 4

④ Edge 4

1	c1	6	7
0	c2	7	c3 6
3	c5	c4	1 7

Cost(E4) = (7-5) + (7-1) + (7-1) + (7-6) + (7-2)
= 2 + 6 + 6 + 1 + 5
= 20

⑤ E5

1	6	c1	5
0	7	c2	6
3	1	c3	7

Cost(E5) = 7×3 - (1+1+6)
= 21 - 8
= 13

⑥ E6

1		6	c1 5
0	c3	c4	1 6
3	c4	1	7

Cost(E6) = 7×4 - (1+5+1+2)
= (7-1) + (7-1) + (7-7) + (7-2)
= 17

⑦ E7

1	6	5	
0	7	6	
3	1	7	

Cost(E7) = 7×4 - (1+6+2)
= 28 - 18
= 10
= (7-1) + (7-1) + (7-6) + (7-2)
= 18

⑧ E8

1	6	5
0	7	6
3	1	7

Cost(E8) = 7×5 - (1+1+7+6+6)
= 21 - (7-1) + (7-1) + (7-7) + (7-6) + (7-6)
= 14

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Edge 3 has minimum cost of 4.

Q.5

$$R = \begin{bmatrix} 10 & 9 & 30 & 4 \\ 7 & 6 & 33 & 37 \\ 51 & 52 & 54 & 53 \\ 55 & 57 & 56 & 58 \end{bmatrix}$$

Max - Min
$= |58 - 4| \not\geq 30$

	R1		R2		
	10	9	30	4	
	7	6	33	37	
R3	51	52	54	53	R4
	55	57	56	58	

R1,
$I_{max} - I_{min} = 10 - 6 = 4$
$\not\geq 30$

		R21	R22
R2,	R3	30	4
		33	37
		R23	R24

$I_{max} - I_{min} = 37 - 4 = 33$
$\not\geq 30$

R3,
$I_{max} - I_{min} = 55 - 51$
$= 4$
$\not\geq 30$

R_4, $I_{max} - I_{min}$
$= 58 - 53$
$= 5$
$\not< 30$

If $|I_{max} - I_{min}| < 8$ merge

R_{21} & R_{23} $\quad 33 - 30 = 3 < 8$

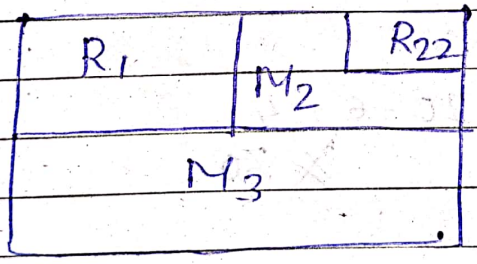
Merge $M_1 = \{R_{21} \cup R_{23}\}$

M_1 & R_{24}, $\quad 37 - 30 = 7 < 8$

Merge $M_2 = \{M_1 \cup R_{24}\}$

R_3 & R_4, $\quad 58 - 51 = 7 < 8$

$M_3 = \{R_3 \cup R_4\}$



10	9	30	4
7	6	33	37
51	52	54	53
55	57	56	58

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Q.4

$$F = \begin{bmatrix} 7 & 5 & 6 & 4 & 5 \\ 7 & 4 & 5 & 7 & 4 \\ 5 & 5 & 6 & 2 & 3 \\ 0 & 3 & 1 & 0 & 4 \\ 2 & 1 & 0 & 2 & 3 \end{bmatrix}$$

Range 0-7
Threshold = 3

① Seed point $S_1(0,0) = 7$ & $T = 3$

$\forall f \; |F(x,y) - 7| \leq 3$

i.e. $F(x,y) = \{4, 5, 6, 7\}$
then $F(x,y) = A$

$$F = \begin{array}{c|ccccc} & 0 & 1 & 2 & 3 & 4 \\ \hline 0 & A & A & A & A & A \\ 1 & A & A & A & A & A \\ 2 & A & A & A & 2 & 3 \\ 3 & 0 & 3 & 1 & 0 & 4 \\ 4 & 2 & 1 & 0 & 2 & 3 \end{array}$$

$R_1 = \{A\}$

② Seed pt. $S_2(2,3) = 2$

$\forall f \; |F(x,y) - 2| \leq 3$

i.e. $F(x,y) = \{1, 2, 3, 4, 5\}$
then $F(x,y) = B$

$$F = \begin{bmatrix} A & A & A & A & A \\ A & A & A & A & A \\ A & A & A & B & B \\ B & B & B & B & B \\ B & B & B & B & B \end{bmatrix}$$

$R_2 = \{B\}$

$R = \{R_1 \cup R_2 \cup R_3\}$

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Q.6

(a) Laplacian is not a good edge operator - False

(b) Laplacian is better than gradient for detection of Edges - False

(c) Image resulting from poor illumination can't be segmented easily - True

(d) Segmentation algo. for monochrome images generally based on 2 basic properties of gray level values - True

(e) First order derivative operators can detect any edge in gray image - False

(f) Hough transform is not suitable of for vertical lines. - False

Q.2

S_1	S_2	S_3	S_4	S_5	S_6	S_7	S_8
0.25	0.15	0.06	0.08	0.21	0.14	0.07	0.04

S_1	0.25	S_8	0.04
S_5	0.21		
S_2	0.15		
S_6	0.14		
S_4	0.08		
S_3	0.06		