Problems in DIP

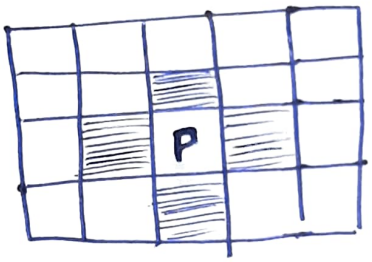
Unit-1

Binary image 2^1 : 2 shades

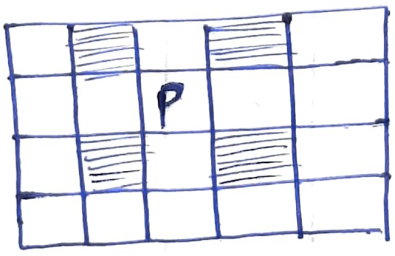
Gray scale 2^8 : 256 shades

coloured imag. 2^{24} : 16.7 million shades

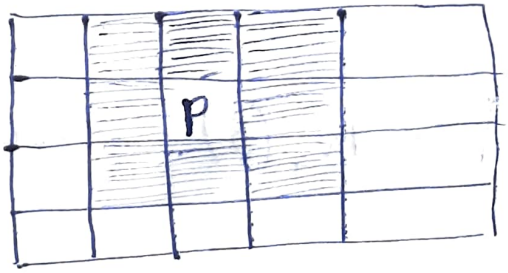
4-neighbour hood : $N_4(P)$



4-diagonal neighbourhood : $N_D(P)$



8-neighbourhood : $N_8(P)$



M adjacent :

let V - {0}

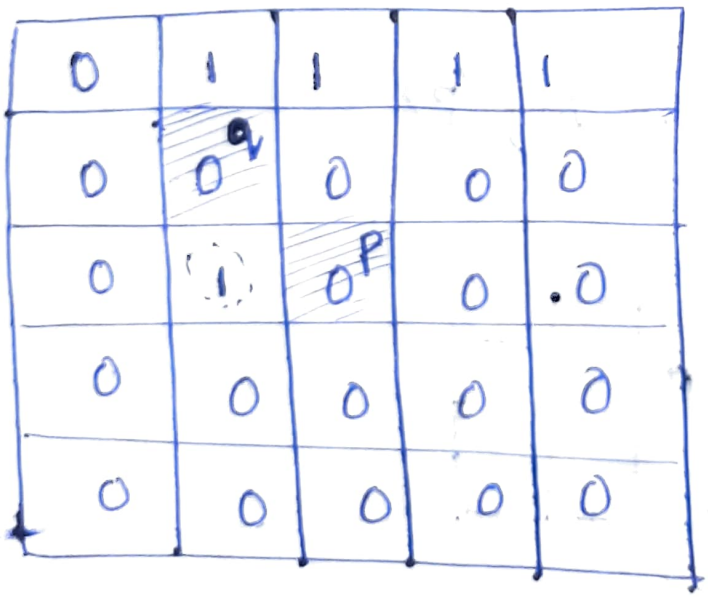
a) q is in $N_4(p)$

or

b) q is in $N_D(p)$ and

set $N_4(p) \cap N_4(q)$ has no values from set V

Q: M adjacent or not ?



a) q is $N_4(p)$: Not

b) q is in $N_D(p)$ yes ✓

$N_4(p) \cap N_4(q) = 1 \neq \{0\} = V$

M adjacent

Q2. Identify Path

i) $V = \{1, 2\}$

0 (11)	1 (12)	1 (13)
0 (21)	2 (22)	0 (23)
0 (31)	0 (32)	1 (33)

8 path from (1,3) to (3,3):

① (1,3) (1,2) (2,2) (3,3) => 4

② (1,3) (2,2) (3,3) => 3

m path from (1,3) to (3,3):

① (1,3) (1,2) (2,2) (3,3) => 4

ii) $V = \{0, 1\}$

	3 (1,1)	1 (1,2)	2 (1,3)	1 (1,4) (q)
	2 (2,1)	2 (2,2)	0 (2,3)	2 (2,4)
	1 (3,1)	2 (3,2)	1 (3,3)	1 (3,4)
(p)	1 (4,1)	0 (4,2)	1 (4,3)	1 (4,4)

shortest path ?

4 path P to q :

(4,1) → (4,2) → (4,3) → (3,3) → (2,3) : Not possible

8 path P to q :

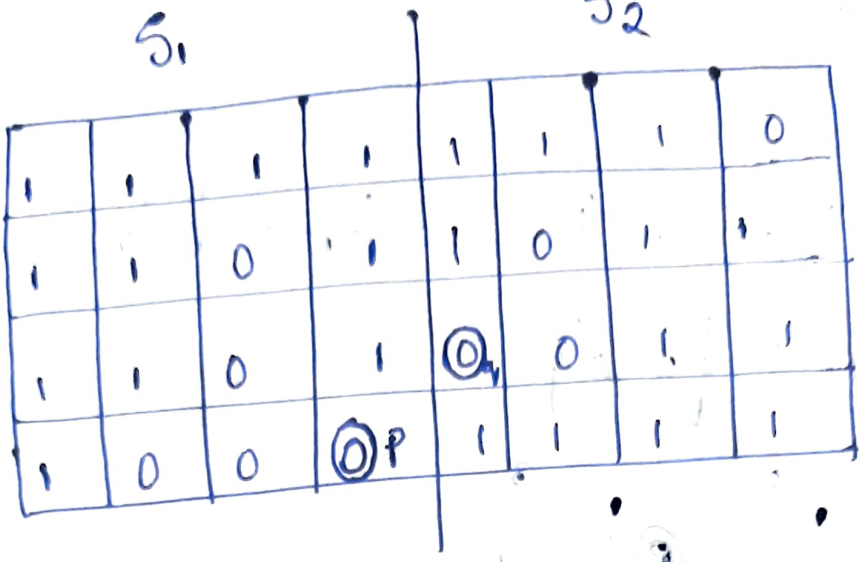
(4,1) → (4,2) → (3,3) → (2,3) → (1,4) : 4

M path P to q :

(4,1) → (4,2) → (4,3) → (3,3) → (2,3) →

(1,4) : 5

Q3. Two images are adjacent, Prove it



V = [0] ?

4 adjecency - Nop

8 adjacency - Yep

m adjacent - Yep

∴ Two images adjacent

Distance Measures :

- Euclidean Distance

$$D_e(p,q) = \sqrt{(x-s)^2 + (y-t)^2}$$

- city block Distance :

$$D_4(p,q) = |x-s| + |y-t|$$

- chess board distance

$$D_8(P,Q) = \max(|x-s|, |y-t|)$$

Q4. Calculate D_e, D_4, D_8 distance between P and Q where $V = \{2,4\}$

	0	1	2	3
0	4	2	2 (P)	3
1	4	3	2	1
2	1	2	2	0
3	2 (Q)	3	1	0

$(x,y) = (0,2)$

$(s,t) = (3,0)$

$$D_e(P,Q) = \sqrt{(x-s)^2 + (y-t)^2}$$

$$= \sqrt{(0-3)^2 + (2-0)^2}$$

$$= \sqrt{9+4} = \sqrt{13}$$

$$D_4(P,Q) = |x-s| + |y-t|$$

$$= |0-3| + |2-0| = 3+2 = 5$$

$D_8[P,Q] = \max\left(|x-3|, |y-1|\right)$

$= \max\left(|0-3|, |2-0|\right)$

$= \underline{\underline{3}}$

Unit 2

Q1. Identify the Operator 'H' is Linear or not ?

Ans

Linear if,

$H[a_i f_i(x,y) + a_j f_j(x,y)]$ equal to

$a_i H[f_i(x,y)] + a_j H[f_j(x,y)]$

$f_1 = \begin{bmatrix} 0 & 2 \\ 2 & 3 \end{bmatrix}$ $f_2 = \begin{bmatrix} 6 & 5 \\ 4 & 7 \end{bmatrix}$

$a = 1$ $b = -1$ $H = \Sigma$