

# IT416: Computer Vision

## Mid Semester Examination

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Q1

According to the equation of perspective projection,

if  $x, y, z$  are coordinates in the Cartesian plane,  $(x, y, z) \rightarrow (f' \frac{x}{z}, f' \frac{y}{z}, f')$

Therefore a point on  $\ell$  has to project to an image point defined by

$$x' = f' \frac{x}{z}$$

$$y' = f' \frac{y}{z}$$

Since the answer has to be in terms of  $a, b, c, d, z$  and  $f'$

$$x = \frac{dz - bz}{a} \quad \text{and given } y = c$$

$$x' = f' \frac{d-bz}{az} \quad \text{and } y' = \frac{f'c}{z}$$

Q2

Subset 1

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

Subset 2

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

- (a)  $S_1$  and  $S_2$  are not 4-connected because  $q$  is not in set  $N_4(p)$ .

Explanation:-

the 4 adjacent pixels to  $p$  are  $(x-1, y)$ ,  $(x, y-1)$  and  $(x, y+1)$ .

$q$  is not one of the above mentioned pixels

- (b)  $S_1$  and  $S_2$  are 8-adjacent because  $q$  is in set  $N_8(p)$

Explanation:-

8-adjacency:- the  $N_4(p)$  and diagonal pixels ( $N_D(p)$ )

$q$  belongs to  $N_D(p)$ .

Hence 8-adjacent.

- (c)  $S_1$  and  $S_2$  are m-adjacent.

Explanation.

- (i)  $q$  is in  $N_D(p)$  and  
 (ii) the set  $N_4(p)$  and  $N_4(p)$  do not have any pixels belonging to  $V$ .

Step 1:- Run Sum.

6 6 6 7 6

5 2 2 3 4

3 3 4 4 5

Pixel Intensities 1 2 3 4 5 6 7 8 9 10 5 7 3 6 2

No. of pixels 0 3 4 4 5 6 3 0 0 0 7 6 5 5 4

Q4.

$$1 \quad V = \{2, 3\}$$

$$(a) \quad D_4 = 3 + 2 + 3 + 2 + 3 + 2 + 3 + 6 = 24$$

(b)

Q5

Q6.

c. (a)  $\# 00FF00$

d. (c) Exposure

e. Spatial domain.