**ASSIGNMENT 1**

Image Processing and Application - 9804

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**Answer to the question no. 1**

We know,

Where, X = target size,

Z = distance from the lens

x = height of CCD array

f = distance between pinhole and CCD

So the target size = 100mm on the size.

Given that we have total of 1024 elements per line, so the resolution of 1 line will be:

/ mm

For line pairs, we divide by 2. We get, line pairs / mm.

Therefore, the number of line pairs per mm is 5-line pairs / mm.

**Answer to the question no. 2**

Given, Affine transformation matrix,

Without homogeneous coordinates we can write,

|  |
| --- |
| Where, = translation in x axis |
| = translation in y axis |
| = scaling in x axis |
| = scaling in x axis |
| = angle of rotation |
|  |

angle of rotation,

Scaling in x-axis,

Scaling in y-axis,

**Answer to the question no. 3**

Obtaining the transformation function T(r)

As we know,

Obtaining the transformation function G(z)

Obtaining the transformation function

z =

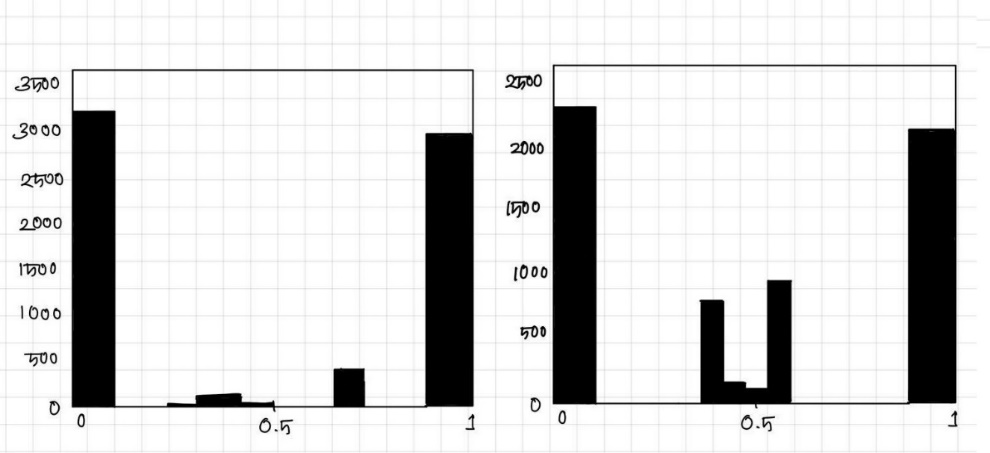
z =

Therefore, we can say that when

**Answer to the question no: 4**

1. The boundary points number between the black and white regions is larger in the image on the right. When the images are blurred with a 3×3 averaging mask, the boundary points will increase to a larger number of different values for the image on the right, that why the histograms of the two blurred images will be different.
2. Assume the image size is N x N, with the surrounded border of 0s. Blurring the image with a 3x3 averaging mask coefficient is 1/9. A larger N would result in a more significant number of 0/255 in the output histogram, where smaller N would result in a lower value. But we have to sure that the summation is equal to N x N.

If we consider the image as 80 x 80 and the black as 0 pixel and white as 1 pixel. The histogram can be plotted as:



**Answer to the question no: 5**

If center pixel depth is > depth of all the neighbors, then it will reduce the center pixel’s depth.

Similarly, if center pixel depth < depth of all neighbors then it will increase the depth of the center pixel.

For Z, it the pixel value will be unchanged which is V = 0 and z’ = z.

The IF-THEN rules are:

Using notation for positive as P, negative as N and zero as Z.

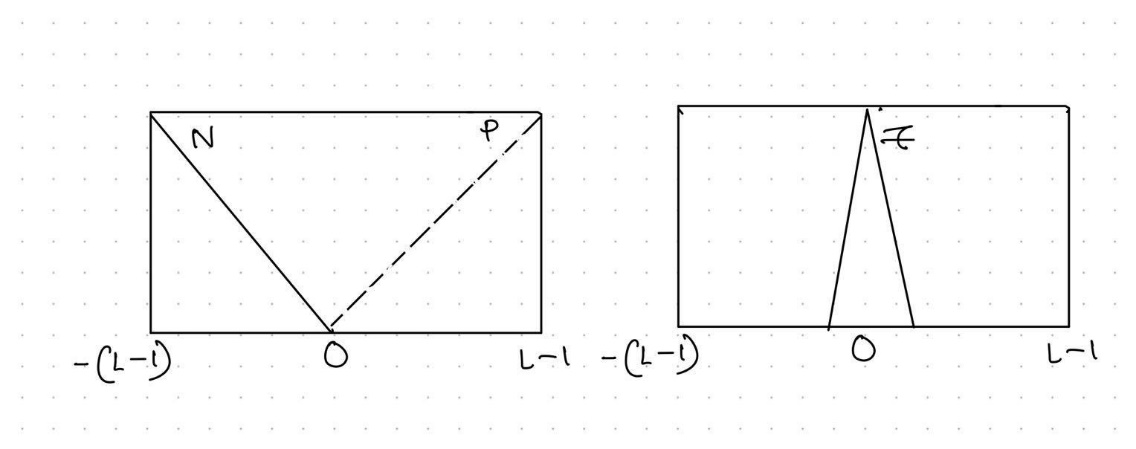
IF is P AND is P AND is P AND is P THEN v is P

IF is N AND is N AND is N AND is N THEN v is negative

ELSE v is *zero*

1. The values of is from –(L-1) to (L-1)

Here, we can use the triangular membership functions for P, N and Z. So, we can find the membership functions are:



1. graphical representation of the rule set:

