Bit plane slicing

Digitally, an image is represented in terms of pixels. These pixels can be expressed further in terms of bits.

In general, 8-bit per pixel images are processed. We can slice an image into the following bit-planes. Zero is the least significant bit (LSB) and 7 is the most significant bit (MSB): 0 which results in a binary image, i.e. odd and even pixels are displayed.

Contrast stretching

Contrast stretching (often called normalization) is a simple image enhancement technique that attempts to improve the contrast in an image by `stretching' the range of intensity values it contains to span a desired range of values, e.g. the full range of pixel values that the image type concerned allows.

Function of grey level slicing

Grey level slicing is the spatial domain equivalent to band-pass filtering. A grey level slicing function can either emphasize a group of intensities and diminish all others or it can emphasize a group of grey levels and leave the rest alone.

Median Filtering Technique

The median filter is a nonlinear digital filtering technique, often used to remove noise. Such noise reduction is a typical pre-processing step to improve the results of later processing (for example, edge detection on an image). Median filtering is very widely used in digital image processing because, under certain conditions, it preserves edges while removing noise

Example: edge detection on an image.

Linear spatial filtering

Linear spatial filtering modifies an image f by replacing the value at each pixel with some

linear function of the values of nearby pixels. Moreover, this linear function is assumed to

be independent of the pixel's location (i; j), where (i; j) indexes the pixels in f, which is

represented as a m*n matrix.

What is noise? Write down the types of noise.

Noise means, the pixels in the image show different intensity values instead of true pixel values.

The common types of noise that arises in the image are

a) Impulse noise, b) Additive noise c) Multiplicative noise.

Write down the basic steps to frequency domain filtering.

There are three basic steps to frequency domain filtering:

The image must be transformed from the spatial domain into the frequency domain using the Fast Fourier transform.

The resulting complex image must be multiplied by a filter (that usually has only real values).

The filtered image must be transformed back to the spatial domain.

Thresholding

Thresholding is the simplest method of image segmentation. From a grayscale image, thresholding can be used to create binary images.

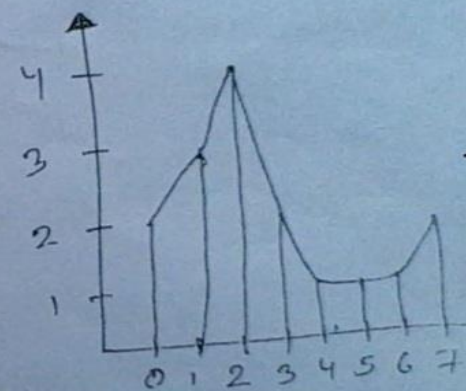**(11)** calculate and draw the histogram of the following image and equalize it   **((4))**

7	0	4	1
2	6	3	7
2	1	0	5
1	2	3	2

Ans:

Histogram

g	f	$c(g)$	$N(g)$
0	2	2	0
1	3	5	2
2	4	9	4
3	2	11	5
4	1	12	5
5	1	13	6
6	1	14	6
7	2	16	7

$n = 16$

[here,
$2^l = 8$
$l = 3$
to represent
8 number
0 to 7.]

[round(2·5)
= 3
round(2·4)
= 2]

$$N(g) = \max\left\{0, \text{round}\left(\frac{2^l * c(g)}{n}\right) - 1\right\}$$

$$N(0) = \max\left\{0, \text{round}\left(\frac{8 * 2}{16}\right) - 1\right\} = 0$$

$$N(1) = \max\left\{0, \text{round}\left(\frac{8 * 5}{16}\right) - 1\right\} = 2$$

Histogram equalization

g	f
0	2
1	0
2	3
3	0
4	4
5	3
6	2
7	2