PREPROCESSING TECHNIQUES FOR IMAGES

IMAGE ENHANCEMENT BASED ON HISTOGRAM

- Pictures become dim due to lack of brightness.

- Brightness can be observed by histogram of an image with grey level and distribution of brightness can be improved by histogram equalisation.

HISTOGRAM

- It represents frequency of pixels in an image. •

Histogram of an image with intensity levels in

the range [0,L-1] is a discrete function $h(r_k)=n_k$,

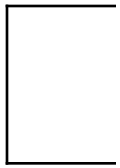
where r_k -> kth intensity value

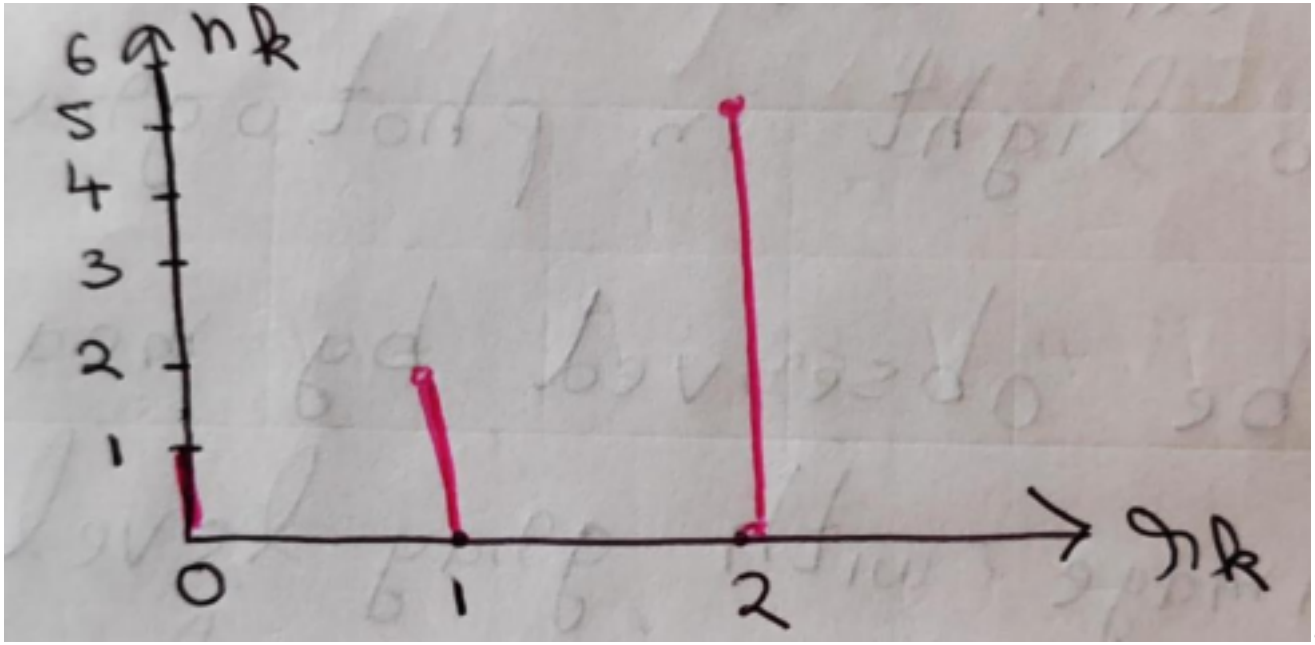
n_k -> number of pixels in image with intensity r_k.

- Consider the image

1
2

2 2 2 1 0 1 2 2 2





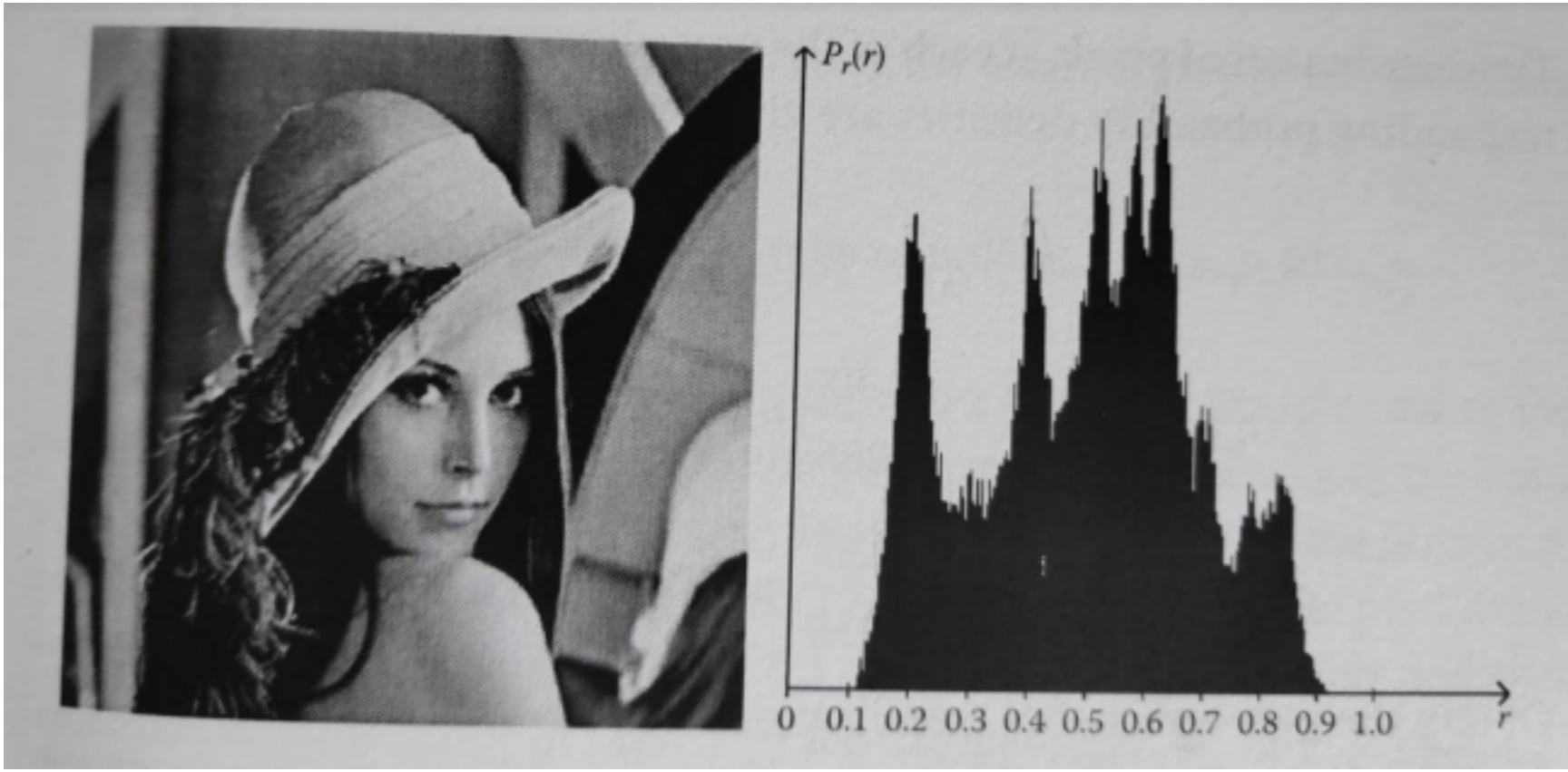
- Histograms can be used for image enhancement, compression and segmentation.
- We normalize a histogram by dividing each of

its components by total number of pixels in image denoted by the product MN, where M and N are row and column dimensions of an image.

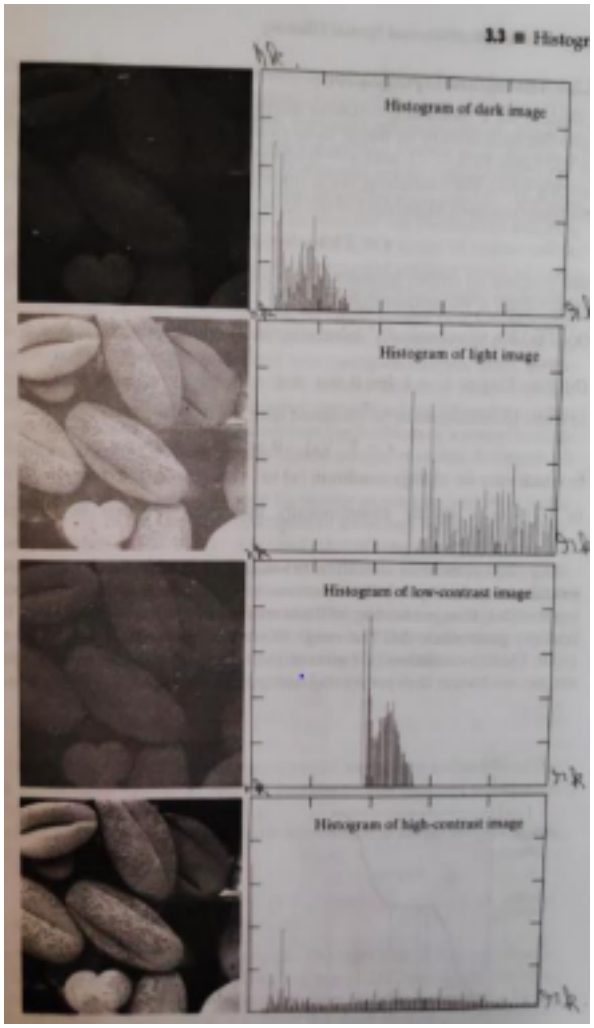
- Normalized histogram is given by:-

$P(r_k) = n_k / MN$

for k= 0,1,2,……,L-1



ROLE OF HISTOGRAM PROCESSING IN IMAGE ENHANCEMENT



HISTOGRAM EQUALIZATION

- It is used to create an image with equally distributed brightness level and also improves the contrast.
- Idea behind this technique is to find a transformation s=T(r) to be applied to each pixel of the input image f(x,y), such that uniform distribution of gray levels in the entire range results for the output image g(x,y).

- Probability of occurrence of gray level r_k in an

image is given by:-

$P_r(r_k) = n_k/n$ -------- (1) • Discrete approximation of transformation function for histogram equalization is:-

$s_k = T(r_k)$

$$= \sum_{j=0}^{k} P_r(r_j) \quad k = 0, 1, 2, \ldots, L-1 \text{ ---------- (2)}$$

- Substituting equation 1 in 2

$$\sum_{j=0}^{k} \quad k=0,1,\ldots\ldots\ldots L-1$$

$$s_k = \sum_{j=0}^{k} n_j / n$$

where r_k->input intensity

s_k-> processed intensity

n_j -> frequency of intensity j

n-> sum of all frequencies