Equalisation Using a Digital Image EEE8064

Algorithmically the operation is:

i)   Create a running sum of histogram values in the source image.
ii)   Normalise by dividing these values by the total number of pixels.
iii)   Multiply these values by the maximum grey level value and then round to the nearest integer.
iv)   Map the original image intensities to the values determined in iii).

e.g. Consider a simple image with the following intensity values (max range 0-7):

Grey Level Value	Number of Pixels
0	10
1	8
2	9
3	2
4	14
5	1
6	5
7	2
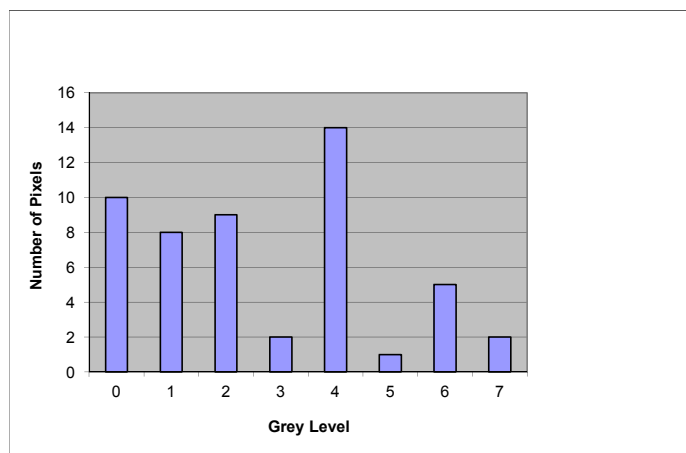
Grey level Value	Number of Pixels	Running Total	Normalise	Xmax Grey	Round
0	10	10	0.20	1.37	1
1	8	18	0.35	2.47	2
2	9	27	0.53	3.71	4
3	2	29	0.57	3.98	4
4	14	43	0.84	5.90	6
5	1	44	0.86	6.04	6
6	5	49	0.96	6.73	7
7	2	51	1.00	7.00	7

Grey Levell	Number of pixels
0	0
1	10
2	8
3	0
4	11
5	0
6	15
7	7

Equalised Histogram
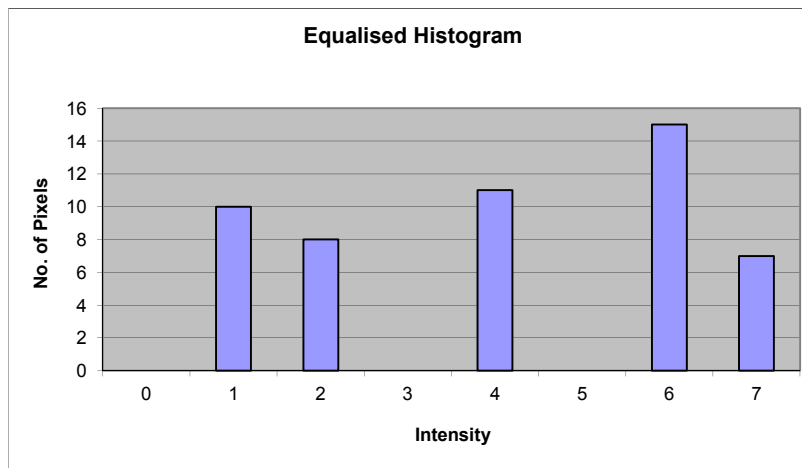
Spatial Filtering

The use of spatial masks for the modification of images is known as spatial filtering.

Such operations can be linear or non-linear.

The basic operation is that a pre-defined mask of weights (usually square) is rubbed across the source image. Typically one an image pixel, usually the centre one, is modified depending upon the weighted sum of the source pixels covered by the mask.
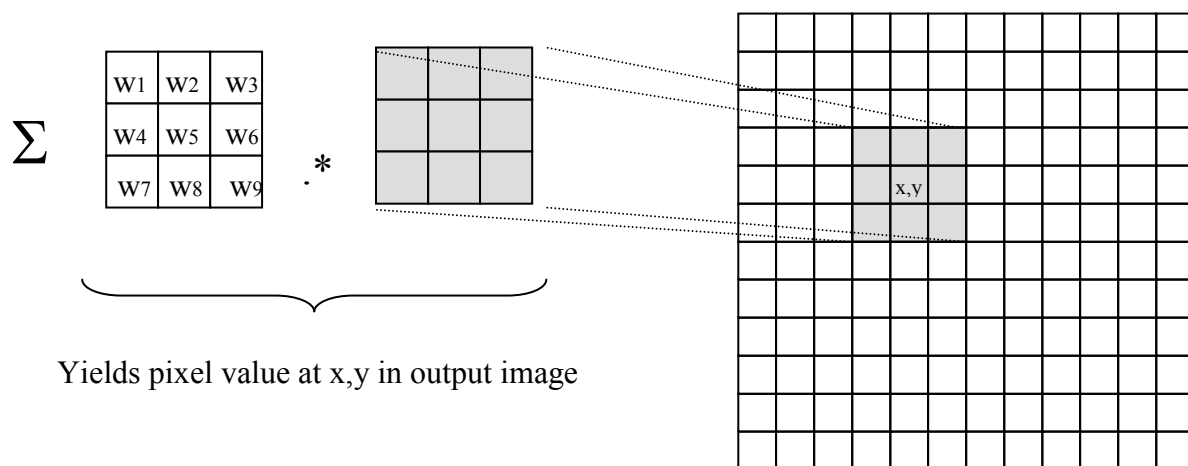
Unless dummy pixels are used on the edge of the source image the resultant image will be smaller than the source image.

The operation is

$$g(x, y) = \sum_{LxL} \mathbf{W}.* \mathbf{f_L}$$

.* denotes pixel multiplication.

e.g. for a 3x3 mask

$$\Sigma$$

W1	W2	W3
W4	W5	W6
W7	W8	W9

.*

x,y

Yields pixel value at x,y in output image

The mask is moved across the whole image.

The mask weights determine the resulting operation

One of the masks that can be used is Sobel.