EXPERIMENT NO. 2
PERFORM AND COMPARE CONTRAST STRETCHING AND HISTOGRAM EQUALIZATION

EXPERIMENT NO. 2

AIM: To perform and compare contrast stretching and histogram equalization

OBJECTIVES:

1. To understand concept of contrast enhancement
2. To perform enhancement of image using contrast stretching.
3. To perform enhancement of image using histogram equalization.
4. To compare performance of both the methods.

EQUIPMENTS/SOFTWARE: SCILAB 6.0.0

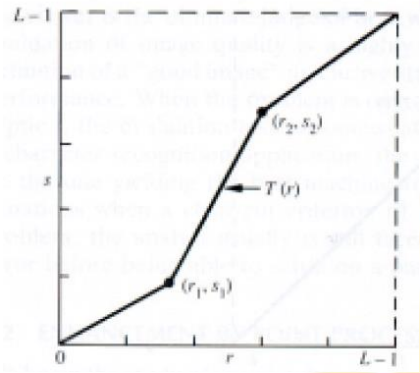
THEORY:

Contrast Stretching/Compression

Stretch gray-level ranges where we desire more information.

Low-contrast images can result from poor illumination, lack of dynamic range in the image sensor, or even wrong setting of a lens aperture during image acquisition.

The idea behind contrast stretching is to increase the dynamic range of the gray levels in the image being processed.



Steps:

1. Read the input image and its size.
2. Obtain values of a, b, v, w.
3. For every pixel of input image check its value and modify to new value accordingly.
4. Display input and output images with title.

Histogram Equalisation:

Histogram of a digital image with gray levels in range [0,L-1] is a discrete function $h(r_k) = n_k$ where r_k -kth gray level and n_k = no. of pixels of an image having gray level r_k.

In histogram there are 3 possibilities as follows,

1. For a dark image the components of histogram on the low (dark) side.
2. For a bright image the component are on high (bright) side

3. For an image with low contrast they are in the middle of gray side.
Histogram equalization is done to spread there component uniformly over the gray scale as far as possible.

This is obtained by function $S_k = \sum_{i=0}^{k} \frac{ni}{n}$

Where $k = 0,1,2, \ldots i-1$

Thus processed image is obtained by mapping each pixel with level r_k into a corresponding pixel with level S_k in output image. This transformation is called Histogram equalization

ALGORITHM:

5. Read the input image and its size.
6. Obtain probability of each the gray level values of each pixel from the image.
7. Compute CDF for each gray value.
8. Compute new value for each input grey level by multiplying its CDF by 255.
9. Replace the input gray values with corresponding new values Sk.
10. Plot the equalized histogram and original histogram
11. Display the original and the equalized image.

PROGRAM OF CONTRAST STRETCHING:

```
//Contrast stretching

// Dikshita Kambri

//118A2044  TE EXTC A3

clc;
clear all;
im = imread("C:\Users\hp\Documents\Image Processing-Scilab\Images\toyobjects.png");
figure(1),
imshow(im);
title("Input image");
im = double(im);
[r,c] = size(im);
jm = zeros(r,c); //output matrix
a = 100;
b = 170;
v = 50;
w = 200;
l = v/a;
m = (w-v)/(b-a);
n=(255-w)/(255-b);

for i =1:r
  for j = 1:c
    if im(i,j) < a then
      jm(i,j) = l *im(i,j);
    elseif im(i,j) < b then
      jm(i,j) = m*(im(i,j) -a)+v;
    else
      jm(i,j) = n* (im(i,j) -b)+w;
    end
  end
end
```

```
figure(2),
imshow(uint8(jm));
title('Output image');
```

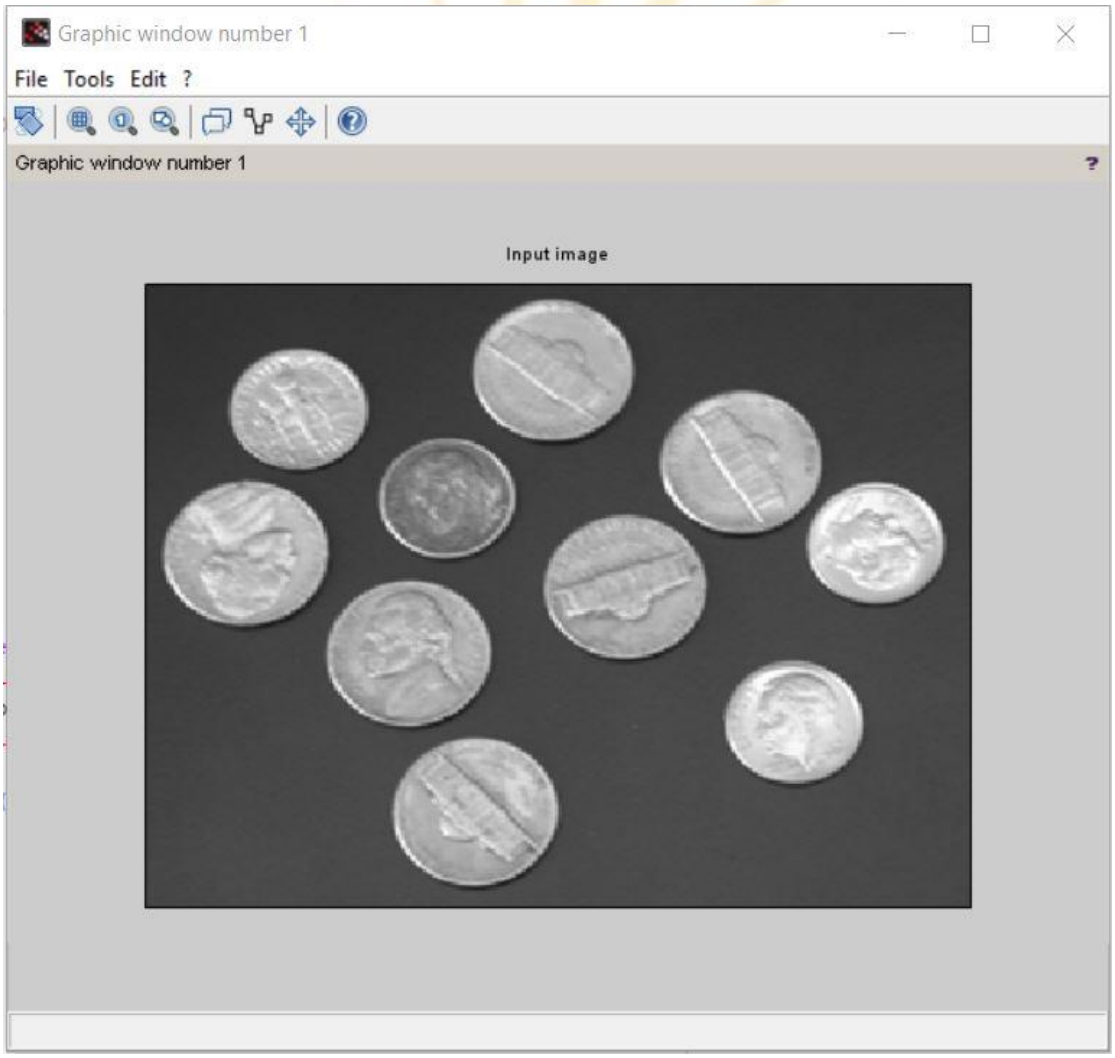
PROGRAM OF HISTOGRAM EQUALIZATION:

```
// Histogram Equalisation

//118A2044 Dikshita Kambri

clc;
clear all;
im=imread("C:\Users\hp\Documents\Image Processing-Scilab\Images\onion.png");
figure(1),
imshow(im);
title('Imput image');
im=double(im);
[r c]=size(im);
jm=zeros(r,c);//output matrix
//input histogram
nk=zeros(1,256);
//for lvl=0:255
//    a=find(im==lvl);
//    l=lvl+1;
//    nk(l)=length(a);
//end
t=0;
for p=1:r
   for q=1:c
      t=im(p,q);
      nk(t+1)=nk(t+1)+1;
   end
end
figure(2), bar(nk);
title('Original image histogram');
pdf=nk/(r*c);
cdf(1)= pdf(1);
for i=2:256
   cdf(i)=cdf(i-1)+pdf(i);
end
sk=round(255*cdf);
//for rk=0:255
//    b=find(im==rk);
//    r1=rk+1;
//    jm(b)=sk(r1);
//end
// Replacing the input pixels by new value
for x=1:r
   for y=1:c
      temp=im(x,y);
      jm(x,y)=sk(temp+1);
   end
end
mk=zeros(r,c);
//for v=0:255
//    p=find(jm==v);
//    v1=v+1;
//    mk(v1)=length(p);
//end
// Histogram of the equalised image
s=0;
for p=1:r
```

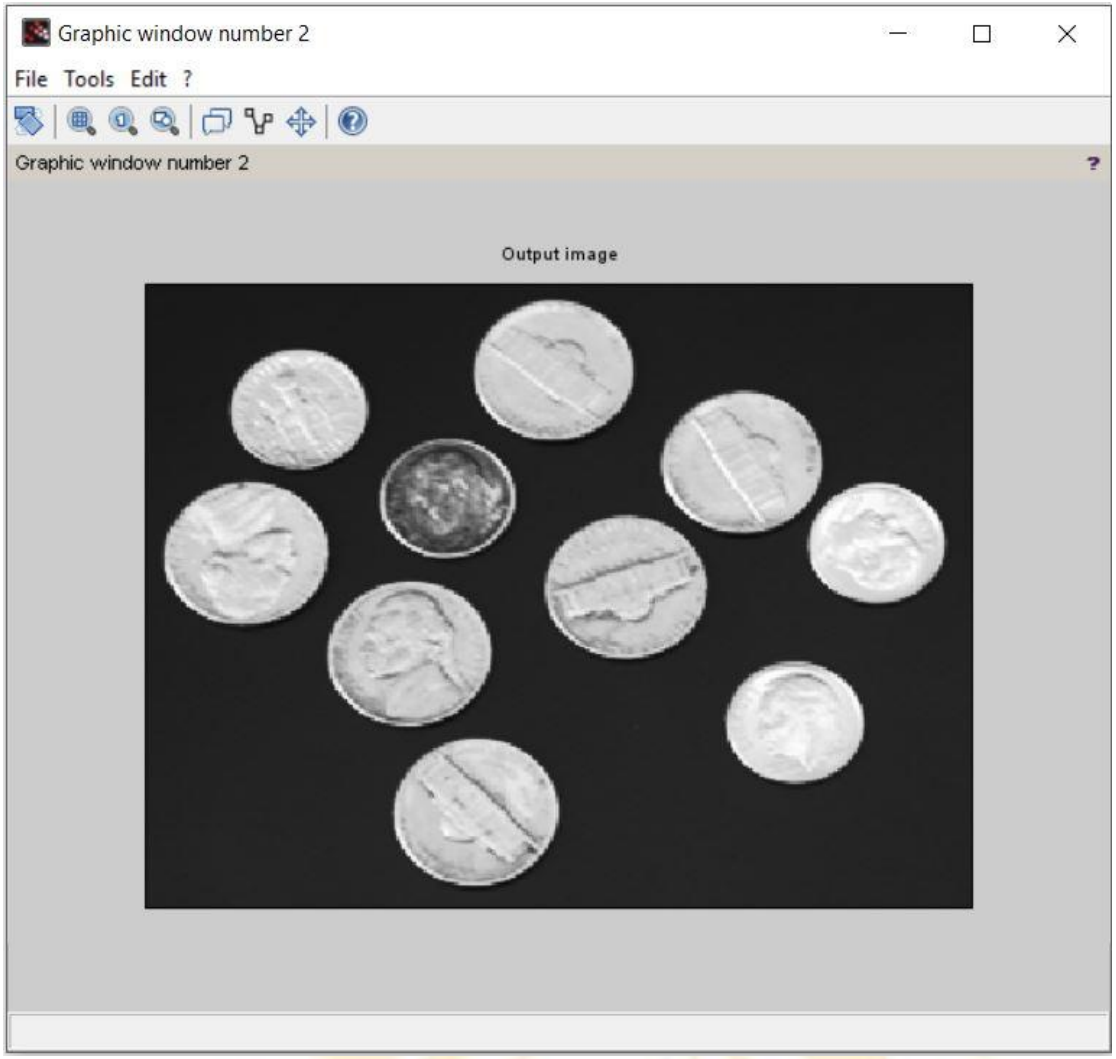
```
   for q=1:c
      s=jm(p,q);
      mk(s+1)=mk(s+1)+1;
   end
end
figure(3), imshow(uint8(jm));
title('Equalised image');
figure(4), bar(mk);
title('Equalised image Histogram');
```

OUTPUT OF CONTRAST STRETCHING:

Input Image:

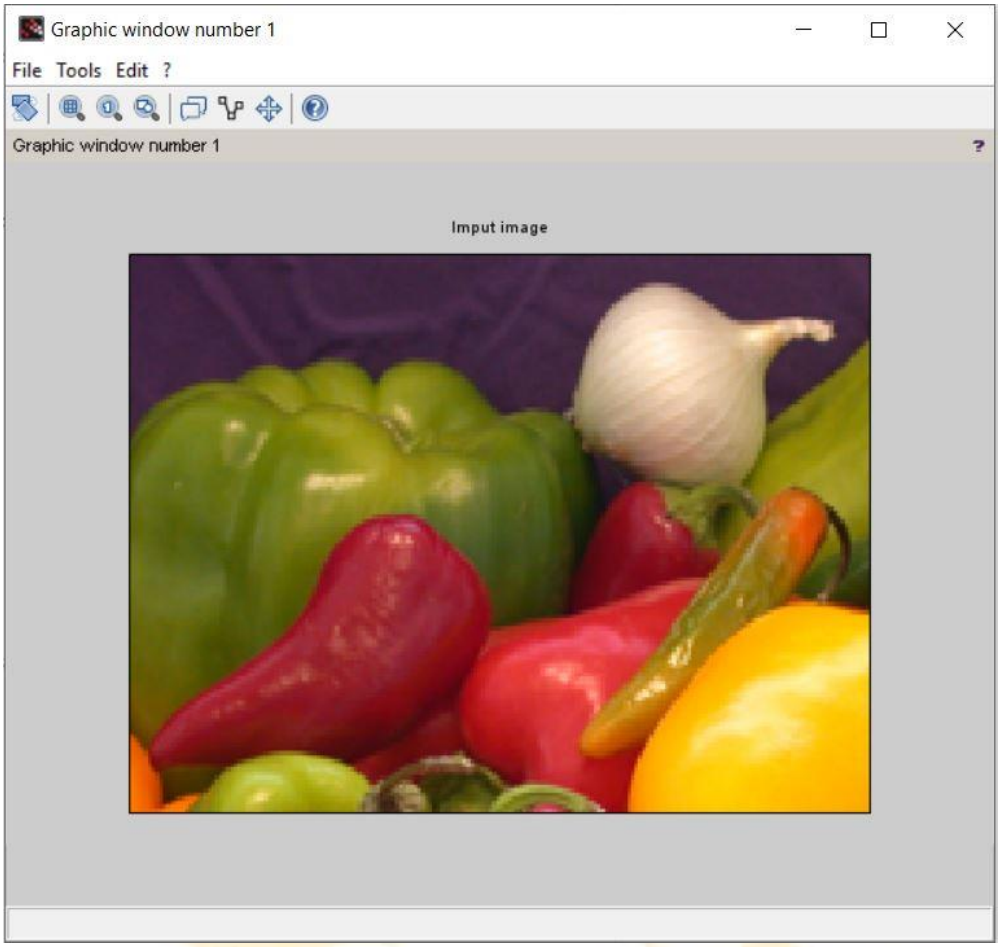


Output Image :

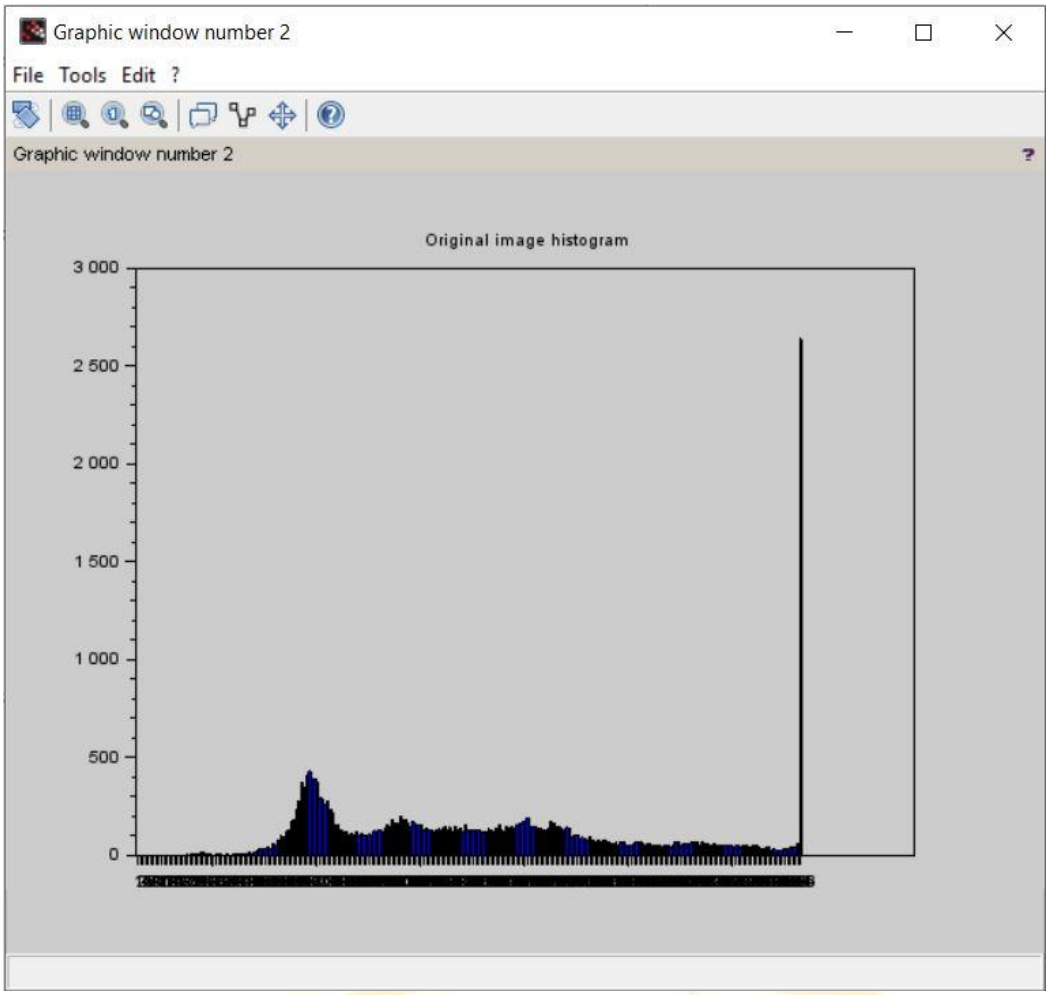


OUTPUT OF HISTOGRAM EQUALIZATION:

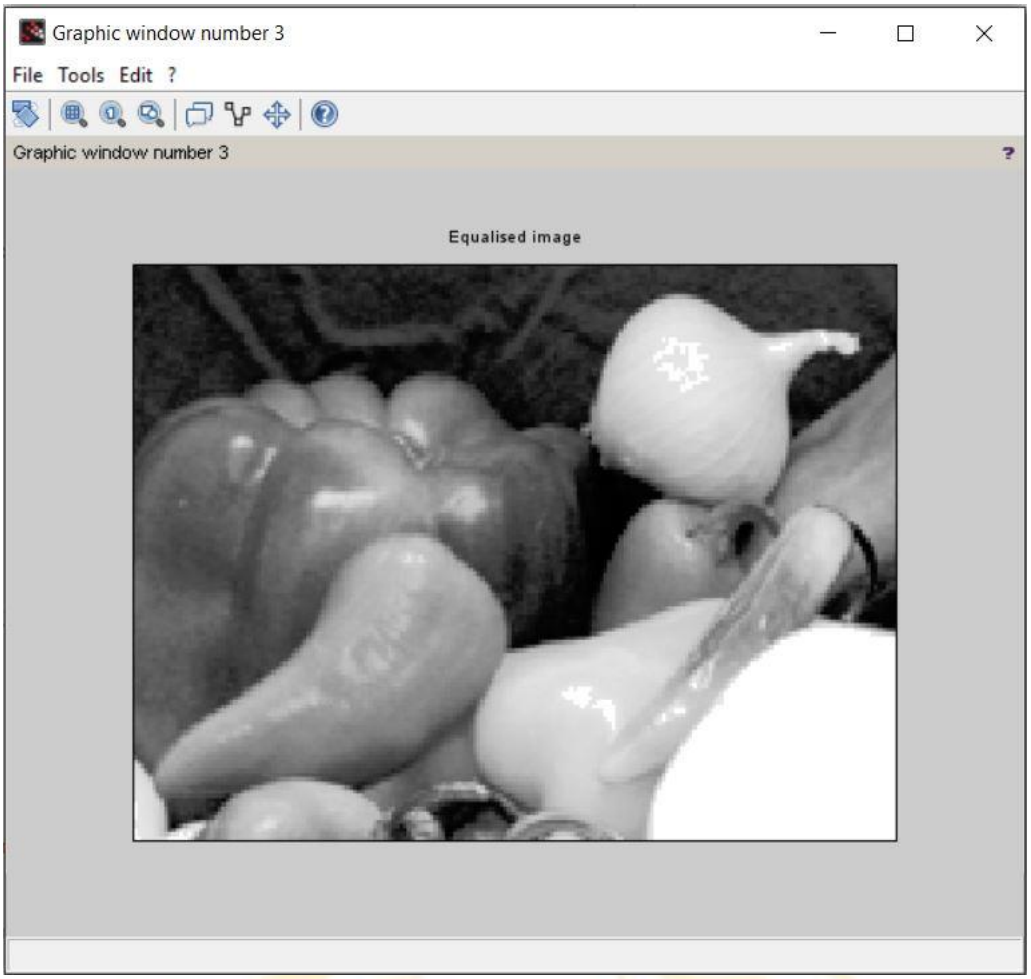
1) **Original image:**



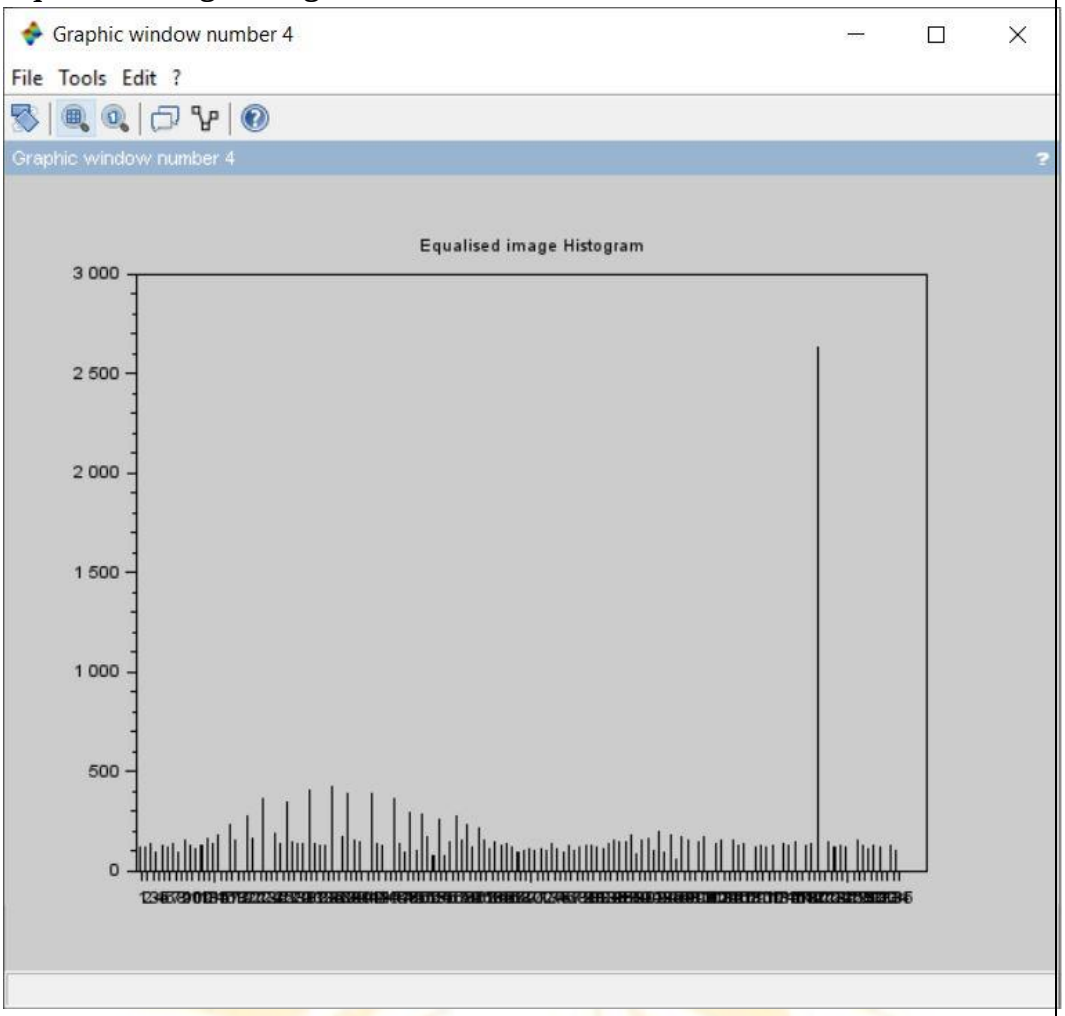
2) Original image Histogram:



3) Equalized image:


Graphic window number 3
File Tools Edit ?
Graphic window number 3
Equalised image

4) Equalized image histogram:



CONCLUSION:

We studied that Contrast stretching is all about increasing the difference between the maximum intensity value in an image and the minimum one. While Histogram equalization is about modifying the intensity values of all the pixels in the image