THE UNIVERSITY OF TEXAS AT ARLINGTON, TEXAS
DEPARTMENT OF ELECTRICAL ENGINEERING

EE 5356

DIGITAL IMAGE PROCESSING

PROJECT # 7

by

SOUTRIK MAITI

1001569883

Presented to

Dr. K.R.RAO

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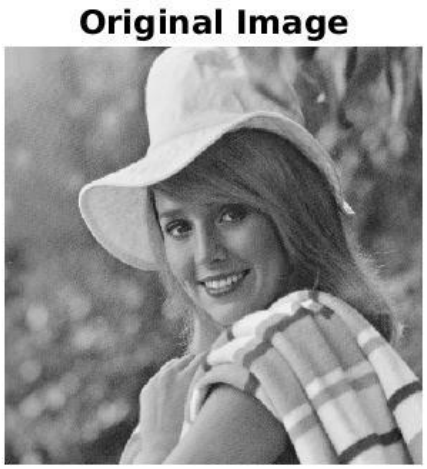
Histogram Equalization and Specification

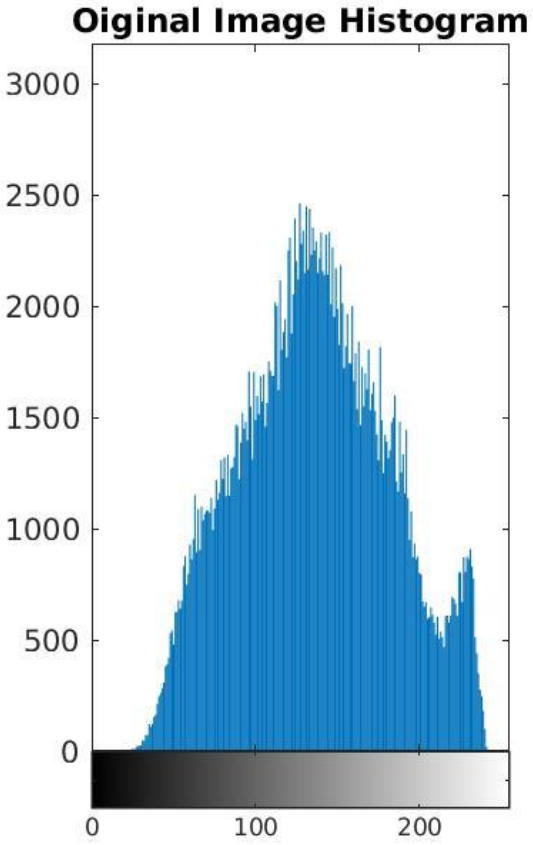
MATLAB Code for the first image:

```
%% Reading and displaying the first image

img = imread('elaine.512.tiff');

figure;
subplot(1,2,1);
imshow(uint8(img));
title('Original Image');
subplot(1,2,2);

%% Applying histogram equalization and displaying original image and
it's histogram

imhist(img);
title('Oiginal Image Histogram');
saveas(gca,'origin_hist.jpg');

%% Performing Global Histogram Equalization

g_hist_img = histeq(img);
figure;
subplot(1,2,1)
imshow(uint8(g_hist_img));
title('Globally Equalized Histogram Image')
subplot(1,2,2)
imhist(g_hist_img);
title('Globally Equalized Histogram');
saveas(gca,'g_hist.jpg');

%% Performing Local Histogram Equalization

l_hist_img =
adapthisteq(img,'clipLimit',0.01,'Distribution','rayleigh');
figure;
subplot(1,2,1)
imshow(uint8(l_hist_img));
title('Locally Equalized Histogram Image');
subplot(1,2,2)
imhist(l_hist_img);
title('Locally Equalized Histogram');
saveas(gca,'l_hist.jpg');

%% Direct Histogram (Straight Line)

st_l = linspace(0,1,512);
d_hist_img = histeq(img,st_l);
figure;
```

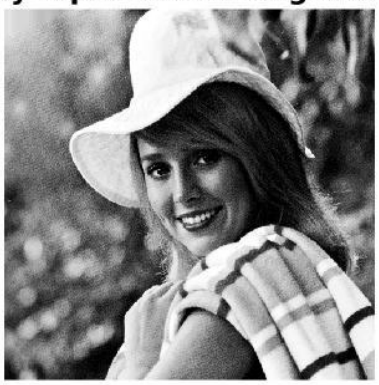
```
subplot(1,2,1)
imshow(d_hist_img);
title('Direct Histogram Image');
subplot(1,2,2)
imhist(d_hist_img);
title('Direct Histogram (Straight Line)');
saveas(gca,'d_hist.jpg');
```

Results:

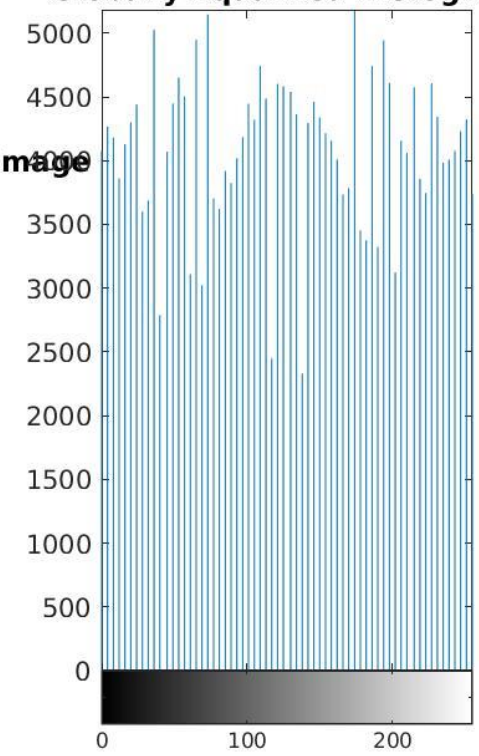




Globally Equalized Histogram Image

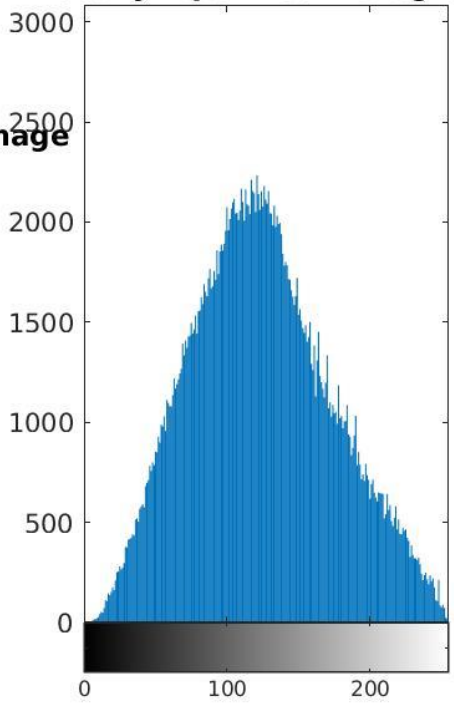


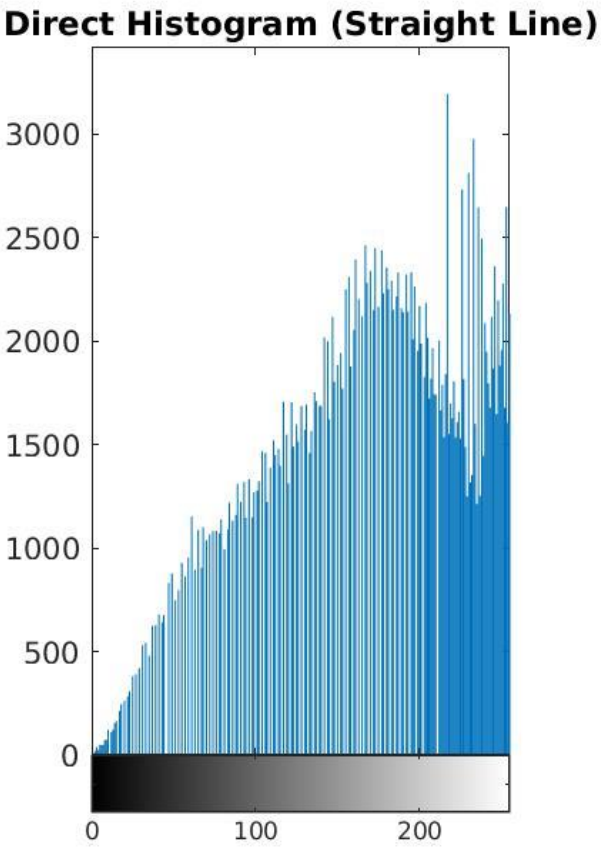
Globally Equalized Histogram



Locally Equalized Histogram Image

Locally Equalized Histogram





MATLAB Code for the second image:

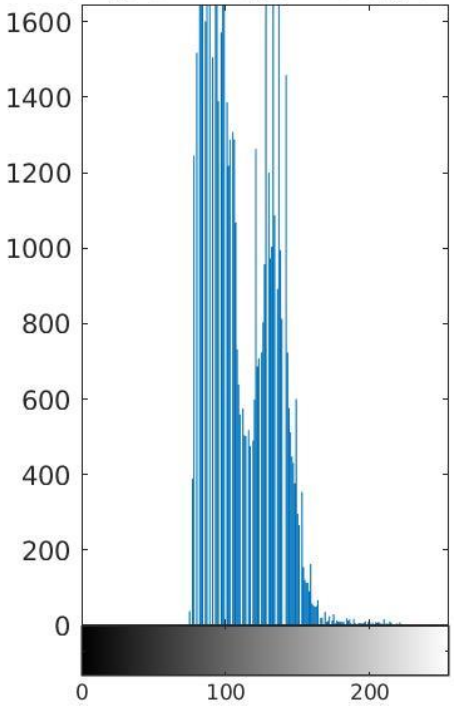
```
%% Performing the same operations for the Second Image

img2 = imread('pout.tif');
figure;
subplot(1,2,1)
imshow(uint8(img2));
title('Orignal Image');
subplot(1,2,2)
imhist(img2);
title('Orignal Image Histogram');
saveas(gca,'origin_hist_2.jpg');

%% Global Hisogram Equalization

g_hist_img2 = histeq(img2);
figure;
subplot(1,2,1)
imshow(uint8(g_hist_img2));
title('Globally Equalized Histogram Image');
subplot(1,2,2)
imhist(g_hist_img2);
```

```
title('Globally Equalized Histogram');
saveas(gca,'g_hist_2.jpg');

%% Local Histogram Equalization

l_hist_img2 =
adapthisteq(img2,'clipLimit',0.01,'Distribution','rayleigh');
figure;
subplot(1,2,1)
imshow(uint8(l_hist_img2));
title('Locally Equalized Histogram Image');
subplot(1,2,2)
imhist(l_hist_img2);
title('Locally Equalized Histogram');
saveas(gca,'l_hist_2.jpg');

%% Direct Histogram (Straight Line)

st_l = linspace(0,1,512);
d_hist_img2 = histeq(img2,st_l);
figure;
subplot(1,2,1)
imshow(d_hist_img2);
title('Direct Histogram Image');
subplot(1,2,2)
imhist(d_hist_img2);
title('Direct Histogram (Straight Line)');
saveas(gca,'d_hist_2.jpg');
```

Results:

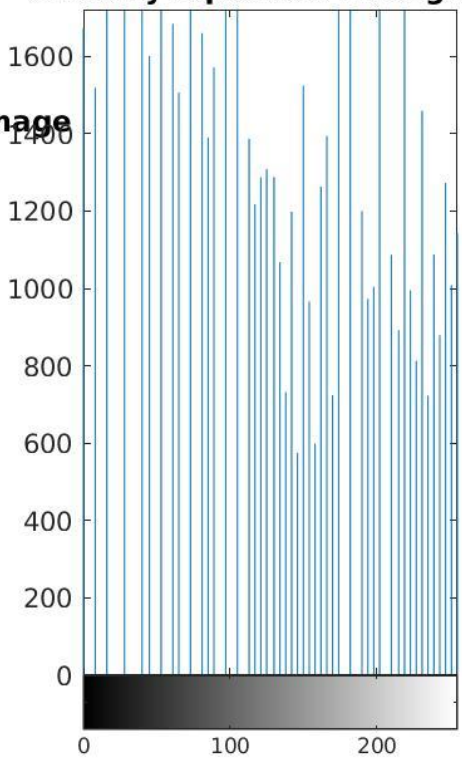
Orignal Image

Orignal Image Histogram



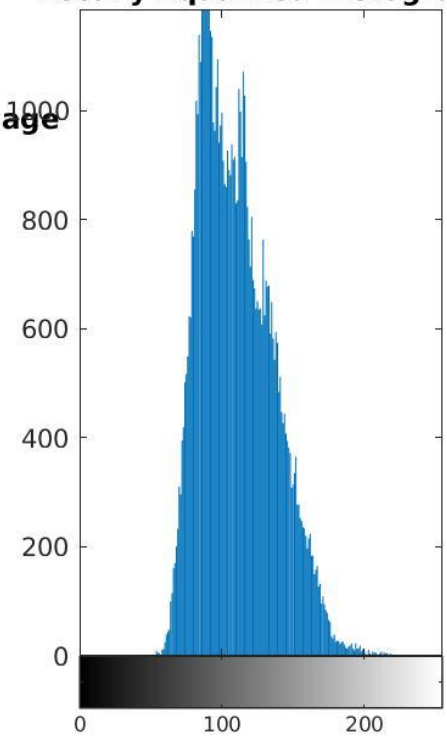
Globally Equalized Histogram Image

Globally Equalized Histogram



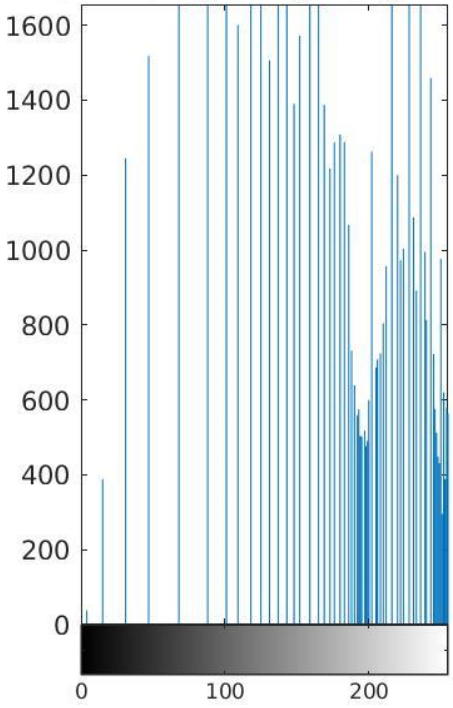
Locally Equalized Histogram Image

Locally Equalized Histogram



Direct Histogram Image

Direct Histogram (Straight Line)



Conclusion:

- *Global histogram uses full range and brings up the contrast of the image by intensifying the pixels.*
- *The histogram is shaped according to the distribution (Rayleigh in our case, the Local histogram is distributed according to the Rayleigh curve)*
- *Pixel intensities are distributed according to a straight line in Direct Histogram Equalization.*
- *Histogram equalization is used to change the contrast of the image by spreading out the most frequent intensities.*