Histogram Equalization

Project #2

**Submitted by:**

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**Objectives:**

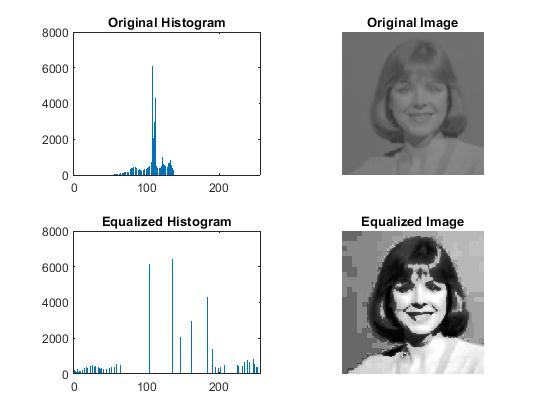
We are going to write a MATLAB program for histogram equalization and improve the quality of grayscale image by increasing the contrast of poor-contrast images. We will the compare the histogram of original poor-contrast image and the histogram of equalize image with those images side-by-side.

**Original Images:**

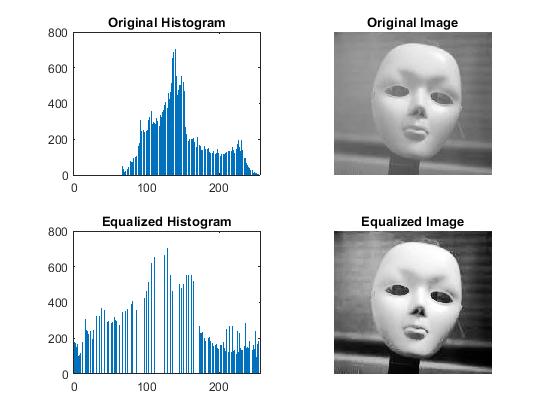
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*Fig1: Lady fig2: Mask fig3: Structures*

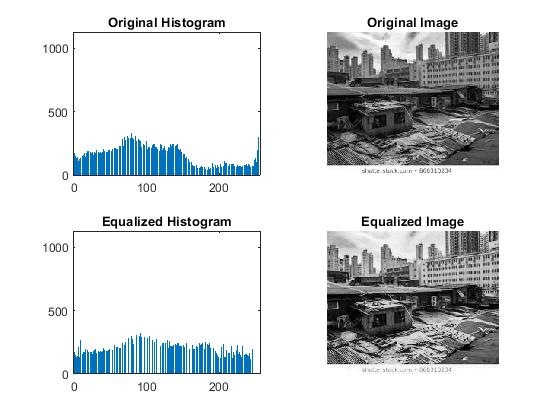
**Results**

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*Fig4: Result of Histogram equalization for fig 1*



*Fig5: Result of Histogram equalization for fig 2*

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*Fig6: Result of Histogram equalization for fig 3*

**Comments**

We mapped the grayscale intensity value of original image to the value derived from the Cumulative Distribution Function. The Cumulative Distribution Function is given as:

Sk = **∑**j=0 px(rj) ; where px(rj) = probability of intensity rj occuring

The use of the CDF function enhances the contrast of the image significantly as can been seen from the above results.

**Matlab Code**

poor\_contrast = rgb2gray(imread('poor\_contrast3.jpg'));

size\_row = size(poor\_contrast,1);

size\_col = size(poor\_contrast,2);

intensity\_label = [0:255];

% for counting the number of each intensity labels

number\_of\_each\_intensity\_label = zeros(1,256);

for L = 1:256

for i = 1:size\_row

for j = 1:size\_col

if (poor\_contrast(i,j) == L-1)

number\_of\_each\_intensity\_label(L) = number\_of\_each\_intensity\_label(L) + 1;

end

end

end

end

% CDF transformation of each intensity label for histgram equalization

hist\_equalized\_intensity = zeros(1,256);

for k = 1:256

for j = 1:k

hist\_equalized\_intensity(k) = hist\_equalized\_intensity(k) + 255\*number\_of\_each\_intensity\_label(j)/(size\_col\*size\_row);

end

hist\_equalized\_intensity(k) = round(hist\_equalized\_intensity(k));

end

% histogram equalized image

new\_image = zeros(size\_row, size\_col);

for L = 1:256

new\_image(poor\_contrast == L-1) = hist\_equalized\_intensity(L);

end

number\_of\_each\_intensity\_label\_new = zeros(1,256);

for L = 1:256

for i = 1:size\_row

for j = 1:size\_col

if (new\_image(i,j) == L-1)

number\_of\_each\_intensity\_label\_new(L) = number\_of\_each\_intensity\_label\_new(L) + 1;

end

end

end

end

new\_image\_gray = mat2gray(new\_image);

subplot(2,2,1), bar(intensity\_label, number\_of\_each\_intensity\_label);

title('Original Histogram');

subplot(2,2,2), imshow(poor\_contrast);

title('Original Image');

subplot(2,2,3), bar(intensity\_label, number\_of\_each\_intensity\_label\_new);

title('Equalized Histogram');

subplot(2,2,4), imshow(new\_image\_gray);

title('Equalized Image');