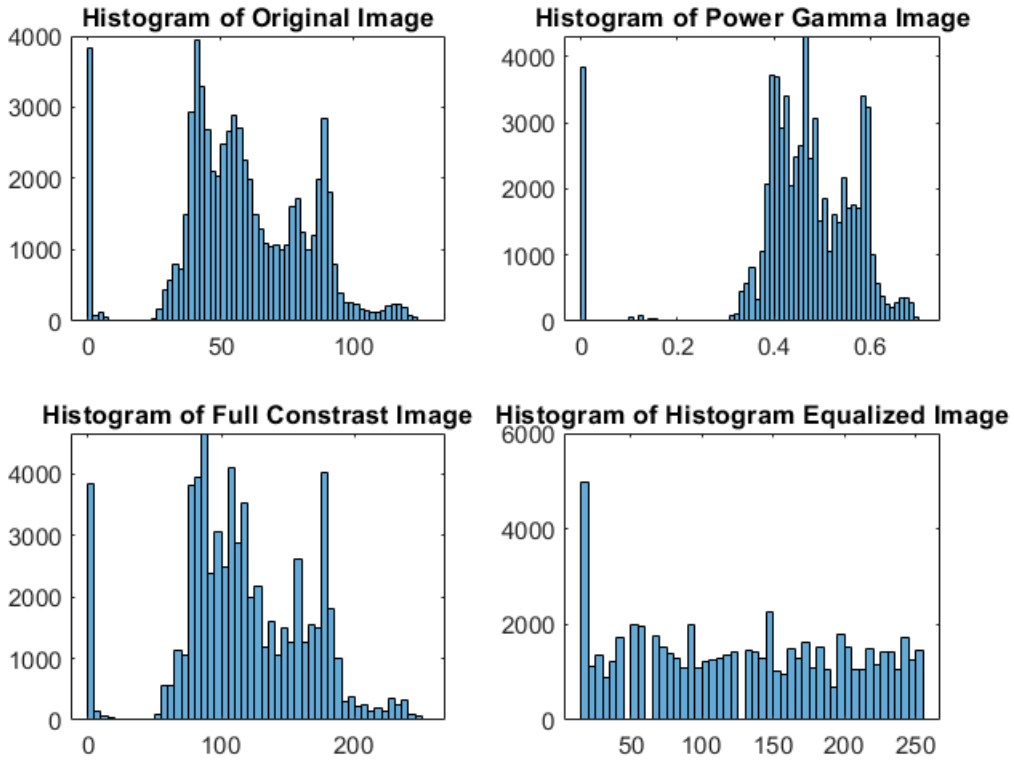
2. Intensity Transformations: Gamma Mapping, Full-scale Contrast Stretch, and Histogram Equalization

```
original_img = imread('books.tif');

% Gamma Intensity transformation
% normalizing the image
norm_img = double(original_img)/255;
constant = 1;
gamma = 0.5;

% Power law transformation
gamma_img = constant*(norm_img).^gamma;

% Full-contrast image
% min-max
n = original_img(:,:,1);
rmin = min(min(n));      % find the min. value of pixel in the image
rmax = max(max(n));      % find the max. value of pixel in the image
% finding slope and interception
full_contrast = (255/(rmax - rmin))*n + (255 - (255/(rmax - rmin))*rmax);

%Histogram Equalization
new_img = imread('C:\Users\Abinaya Ravichandran\Desktop\Fall 2020\ECE613\Homework2\Q2\books.tif
hist_eq=zeros(1,256);
[norm_img, constant] = size(new_img);
pixel=norm_img*constant;

%Calculating Histogram
for n = 1 : norm_img
    for m = 1 : constant
        hist_eq(new_img(n,m)+1) = hist_eq(new_img(n,m)+1)+1;
    end
end

%Calculating Probability
for n=1:norm_img
    hist_eq(n)=hist_eq(n)/pixel;
end

%Calculating Cumulative Probability
temp = hist_eq(1);
for n=2:norm_img
    temp=temp+hist_eq(n);
    hist_eq(n)=temp;
end

% Mapping
for n=1:norm_img
    for m=1:constant
        new_img(n,m)=round(hist_eq(new_img(n,m)+1)*(norm_img-1));
    end
end

subplot(2,2,1); imshow(original_img); title('Original Image');
```

```
subplot(2,2,2); imshow(gamma_img); title('Power Gamma Image');
subplot(2,2,3); imshow(full_contrast); title('Full Constrast Image');
subplot(2,2,4); imshow(new_img); title('Histogram Equalized Image');
```


```
figure(2),
subplot(2,2,1); histogram(original_img);  title('Histogram of Original Image');
subplot(2,2,2), histogram(gamma_img);  title('Histogram of Power Gamma Image');
subplot(2,2,3); histogram(full_contrast);title('Histogram of Full Constrast Image');
subplot(2,2,4); histogram(new_img);title('Histogram of Histogram Equalized Image');
```



Observations:

Gamma intensity transformation on the original image have increased the brightness of the image but lacks contrast, also the histogram shows the pixels being shifted but do not help in equalizing. Full Constrast image have increased the brightness and sharpness of the original image, yet, black-point is not gained and the pixel values are not wide spread enough. Histogram equalizer have enchanced the image in means of bringtness, constrast, sharpness and also the histogram shows that the pixels are almost equally distributed among the frame. Histogram equalizer has efficiently transformed the original.