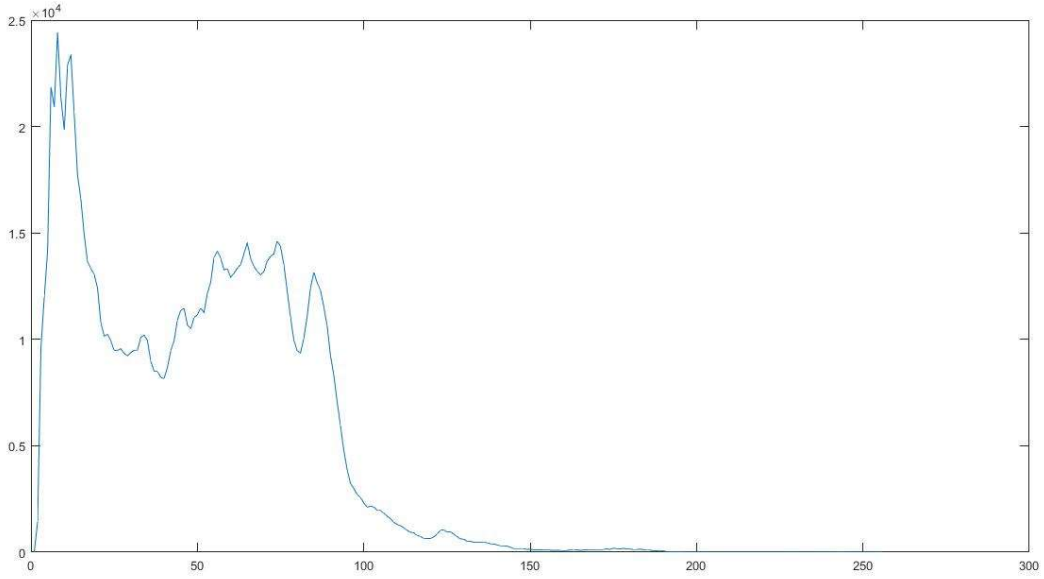
PURVANG LAPSIWALA

UIN = 662689378

Homework 2

1. Plot for part 1

Histogram For Given Image



2.

(a) Thresholding can be done with different ways. For this problem, mean value for given Image is used. So, the threshold value is basically the mean intensity of all the pixels of an image.

(b)

(c) When thresholding to the image is applied, the image turned into a black and white image from a grayscale image. This is because all the pixels above the threshold value were treated as an intensity of 1 and those below were treated an intensity of 0. Thus, the image was left with only two colors.

(d) Thresholding value used is 48.0941. Thresholding can be applied using different methods. For this problem, I have used step function, Max function which is maximum pixel value, min, mean function etc. and found that using mean value gives best result for given problem.

3.

(a)

(b) For Contrast stretching, stretching has to be done for only 90% of the image by removing the 5% from the lowest intensity pixels and the 5 % of the highest intensity pixels. The pixel intensities ranged from 1 to 245. The pixels that were corrected were approximately in the range of 13.20 to 232.80.

(c) The contrast stretching is basically a measure of the spread of an images' histogram. It is used to improve the contrast in an image by changing the intensity values. As the range of pixels is nearly equal to the range of the intensities of the original image so we get almost the same output. We can see a slight increase in contrast in the new image.

4.

(a) Selected Gamma value = 0.4

(b)

(c) Gamma Value selected for the given problem is 0.4 after analyzing output at different values and also selection of this value done as it is given in textbook as standard gamma value.

(d) Gamma is a relationship between an input and a resulting image. Gamma correction is used to make the image display on a screen as it is seen with the eye or we can say that it is a way to undo the monitor's unfortunate work. On applying the specified gamma correction we can see that the intensities of all the pixels have been enhanced by the same factor.

5.

(a)

(b) By applying histogram equalization to our image we can see that the contrast of the image has been enhanced. This is done by adjusting the pixel intensities of the original image.

MATLAB CODE:

```
% For displaying an image:

original_image = imread('image.bmp');
imshow(original_image);

% For Thresholding:

clc;
clear all;

image = imread('image.bmp');
image_size = size(image);
H=zeros(1,256);
meanIntensity = mean(mean(image));
for i = 1:948
        for j = 1:1268
        c = image(i,j);
        H(c+1) = H(c+1)+1;
        if image(i,j) >= meanIntensity
                tempImage(i,j) = 1;
        else
                tempImage(i,j) = 0;
        end
```

```
        end
end
figure(1);
plot(H);
figure(2);
imshowpair(image,tempImage,'montage');


% For Contrast Stretching:

clc;
clear all;
original_image = imread('image.bmp');
a = 0;
b = 255;
c = min(min(original_image));
d = max(max(original_image));
range = d-c;
limit = double((double(range)/100)*5);


factor = (d - c)/(d + c);
for i = 1:948
   for j = 1:1268
      if((((original_image(i,j) - factor)*(b - a)/(d - c)) + a)>= 0)
         if((original_image(i,j)>(c +limit) || original_image(i,j)<(d - limit)))
            part1 = (original_image(i,j) - factor);
            const = (b - a)/(d - c);
            fina = part1*const + a;
            new_image(i,j) = fina;
         elseif((original_image(i,j)<(c +limit)))
            new_image(i,j) = a;
         elseif(original_image(i,j)<(d - limit))
            new_image(i,j) = b;
         end
      else
         new_image(i,j) = 0;
      end
   end
end
imshowpair(original_image,new_image,'montage')


% For Gamma Correction:

clc;
clear all;
original_image = imread('image.bmp');
original_image = double(original_image);
c = min(min(original_image));
d = max(max(original_image));
factor = (d-c)/(d+c);
```

```
gamma = 0.3;

for i = 1:948
   for j = 1:1268
      new_image(i,j) = factor * (original_image(i,j) ^ gamma);
   end
end

imshowpair(original_image,new_image,'montage')


% For Histogram Equalization:

clc;
clear all;
original_image = imread('image.bmp');
c = min(min(original_image));
d = max(max(original_image));
L = 256;
p = zeros(1,256);
total_pixels = 948 * 1268;

for i = 1:948
   for j = 1:1268
      temp = original_image(i,j);
      p(1,temp) = p(1,temp) + 1;
   end
end
sum = 0;

for i = 1:256
   p(1,i) = double(p(1,i)/total_pixels);
   sum = sum + p(1,i);
   cdf(i) = sum;
end



for i = 1:948
   for j = 1:1268
      new_image(i,j) = floor((L-1)*cdf(original_image(i,j))) ;
   end
end
imshowpair(original_image,new_image,'montage');
```