

EE 440 Autumn 2018
Homework 2 Report

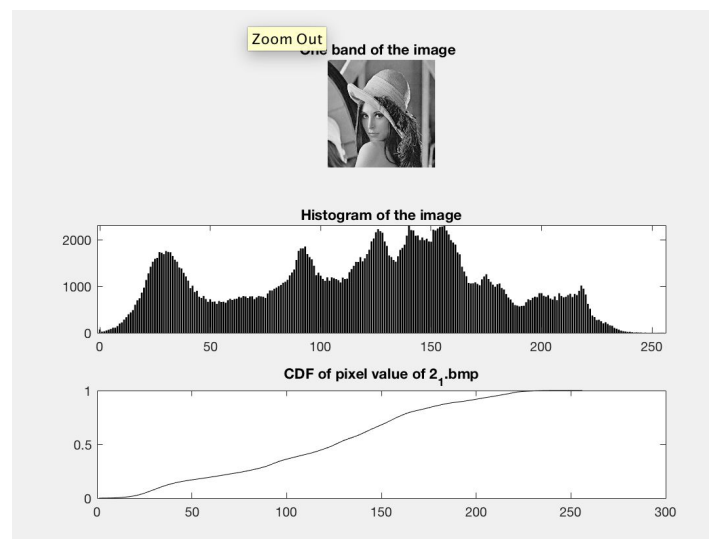
Professor: Ming-Ting Sun
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Problem 1 Histogram and Cumulative Distribution Function of Histogram

In this problem we want to get the histogram without using `imhist` function and `hist` function. I initially read the image and use R image as the band that I selected to do this problem. Then I used `size` function and `zeros` function to determine the size of this band and to create a sequence full of zeros. Then I used `for` loop to go through each gray level and display the number of pixels on this gray level. Then I used the result got from above divided by the number of element in the band we chose. The result from last step is call PDF. After I got PDF, I used `cumsum` function to find the cumulative sum from the first element of PDF, and the result of this step is called CDF. Then we use `subplot` function to plot the band of the image, histogram of the band image and the CDF in one figure. Because I want to make the graph looks neat and cool, I drew them within black color. Here are the output graphs and the Matlab code:



```
1 % He Feng
2 % EE 440 HW 2 Problem 1
3 close all;
4 clear all;
5
6 I = imread('2_1.bmp');
7 % Use one of the band to plot the histogram.
8 I_band = I(:,:,1);
9
10 % Determine the size of this band of image.
11 % Let a variable starts at all zeros.
12 [m,n] = size(I_band);
13 value = zeros(1,256);
14
15 % Using for loop to find the number of pixels on each gray level.
16 for k=0:255
17     numberOfPixel = find(I_band == k);
18     value(k+1)=length(numberOfPixel);
19 end
20
21 % numel function returns the number of elements in I_band
22 PDF = value/numel(I_band);
```

```

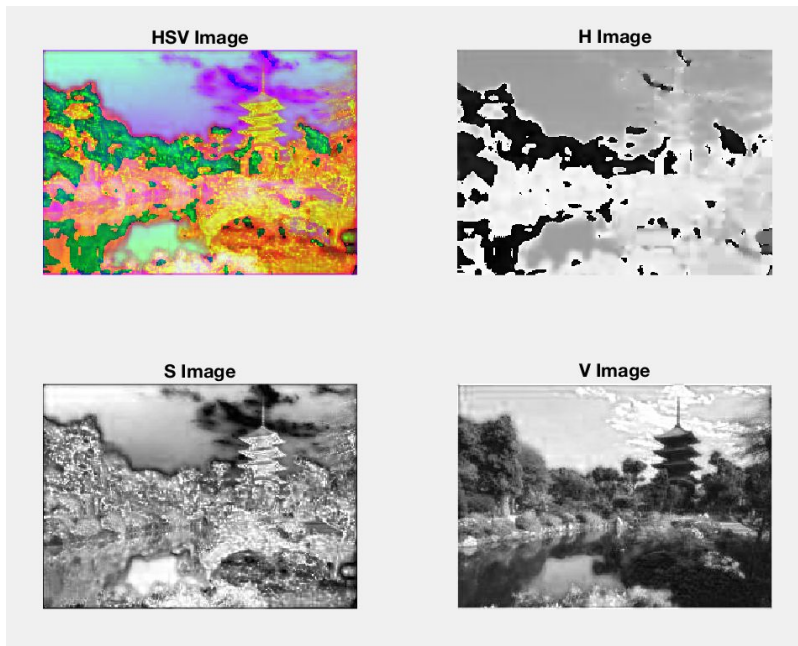
22 - PDF = value/numel(I_band);
23 - % Find the cumulative sum from the first element of PDF.
24 - CDF = cumsum(PDF);
25
26 - figure;
27 - % Plot one band of the image.
28 - subplot(3, 1, 1);
29 - imshow(I_band);
30 - title('One band of the image ');
31
32 - % Plot the histogram within a bar format by using bar function.
33 - % Make the histogram to the color of black because it looks cooler.
34 - subplot(3, 1, 2);
35 - bar(0:255,value,'k');
36 - title('Histogram of the image')
37
38 - % Plot the CDF which has been described above.
39 - subplot(3, 1, 3);
40 - plot(CDF,'k');
41 - title('CDF of pixel value of 2_1.bmp')

```

Problem 2 RGB Image and HSV Image

In this problem we want to draw the R G B images and H S V images of the given original image. Initially we read the image and then we find the R G B image by choosing different band of the original image. Then we used subplot to plot the original image, red image, green image and blue image in the first figure. Then we used `rgb2hsv` function to convert the image to HSV format, and we used the same method to determine the H S V images. Finally we used subplot to plot HSV image, H image, S image and V image. Here are the output graphs and the Matlab code:





```

1 % He Feng
2 % EE 440 HW 2 Problem 2
3 close all;
4 clear all;
5
6 % Read the image.
7 image = imread('2_2.bmp','bmp');
8
9 % Find the R G B images.
10 image_r=image(:,:,1);
11 image_g=image(:,:,2);
12 image_b=image(:,:,3);
13
14 % Plot the original image and three components image in one figure.
15 figure(1)
16 subplot(2,2,1);
17 imshow(image)
18 title('Original Image');
19 subplot(2,2,2);
20 imshow(image_r)
21 title('Red Image');
22 subplot(2,2,3);
23 imshow(image_g)

```

```

24 title('Green Image');
25 subplot(2,2,4);
26 imshow(image_b)
27 title('blue Image');
28
29 % Convert the image to HSV
30 figure(2)
31 hsva = rgb2hsv(image);
32 image_h = hsva(:,:,1);
33 image_s = hsva(:,:,2);
34 image_v = hsva(:,:,3);
35 subplot(2,2,1);
36 imshow(hsva)
37 title('HSV Image');
38 subplot(2,2,2);
39 imshow(image_h)
40 title('H Image');
41 subplot(2,2,3);
42 imshow(image_s)
43 title('S Image');
44 subplot(2,2,4);
45 imshow(image_v)
46 title('V Image');
47

```

Problem 3 Produce the Negative of An Image

For the last problem of this I need to get the negative of an image. Initially I read the image and display the original image such that we can compare it later. Then convert the image to negative band by band. I used `negative(:,:,1)=255-image(:,:,1)` to get the negative of the red band.

'Negative' and 'image' are all the variable names. After doing this three times and I got the negative of all three bands, I display it in the same figure above. Here are the output graphs and the Matlab code:



```
1 % He Feng
2 % EE 440 HW 2 Problem 3
3 - close all;
4 - clear all;
5
6 % Read the original image.
7 - image = imread('2_1.bmp','bmp');
8 % Plot the original image.
9 - subplot(1,2,1);
10 - imshow(image)
11 - title('The Original Image');
12
13 % Get the negative of each R G B images.
14 % Plot the negative image.
15 - negative(:,:,1)=255-image(:,:,1);
16 - negative(:,:,2)=255-image(:,:,2);
17 - negative(:,:,3)=255-image(:,:,3);
18 - subplot(1,2,2);
19 - imshow(negative)
20 - title('the Negative Image');
21
```