SESSIONAL ASSIGNMENT 2

Abdullah Mahmud

150205

Exercise 1.

Problems Statement:

It is often to see in newspapers a children task which is to find the differences between two apparently equal black and white cartoons. Implement a simple code to find the differences between them. Use an
arbitrary cartoon. Could you show another example in which image arithmetic will be useful?

Explanation:

Read both images, using image subtraction determine the differences and observe the results.

Code:

```
% 1
image1 = imread('a1image1.jpg');
image2 = imread('a1image2.jpg');
figure;
subplot(2,2,1),imshow(image1),title('cartoon1');
subplot(2,2,2),imshow(image2),title('cartoon2');
subplot(2,2,3),imshowpair(image1,image2),title('imshowpair');
subplot(2,2,4),imshow(imabsdiff(image1,image2)),title('imabsdi
ff');
```

Output:

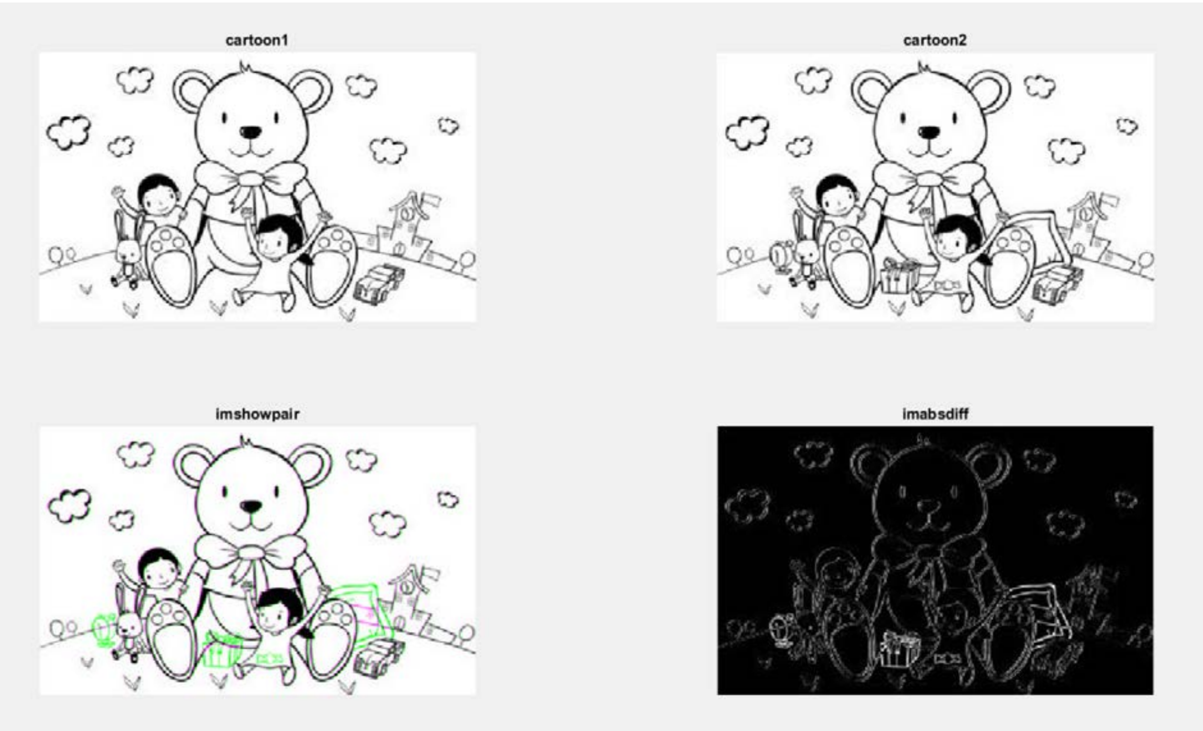


Image arithmetic can be useful in cases like moving object detection.

Exercise 2.

Problem Statement:

The focus of this exercise is to experiment with intensity transformations to enhance an image. Download the image *spine.jpg* and enhance it using:
i- the log transformation. We would use a transformation of this type to expand the values of dark pixels in an image while compressing the higher level values.
ii- a power-law transformation.

In (i) the only free parameter is *c*, but in (ii) there are two parameters, *c* and γ for which values have to be selected.
As in most enhancement tasks, experimentation is a must. The objective of this exercise is to obtain the best visual
enhancement possible with the methods in (i) and (ii). Once (according to your judgement) you have the best visual
result for each transformation, explain the reasons for the major differences between them.

Explanation:

The problem is to read the given image and transform the image.

Procedure:

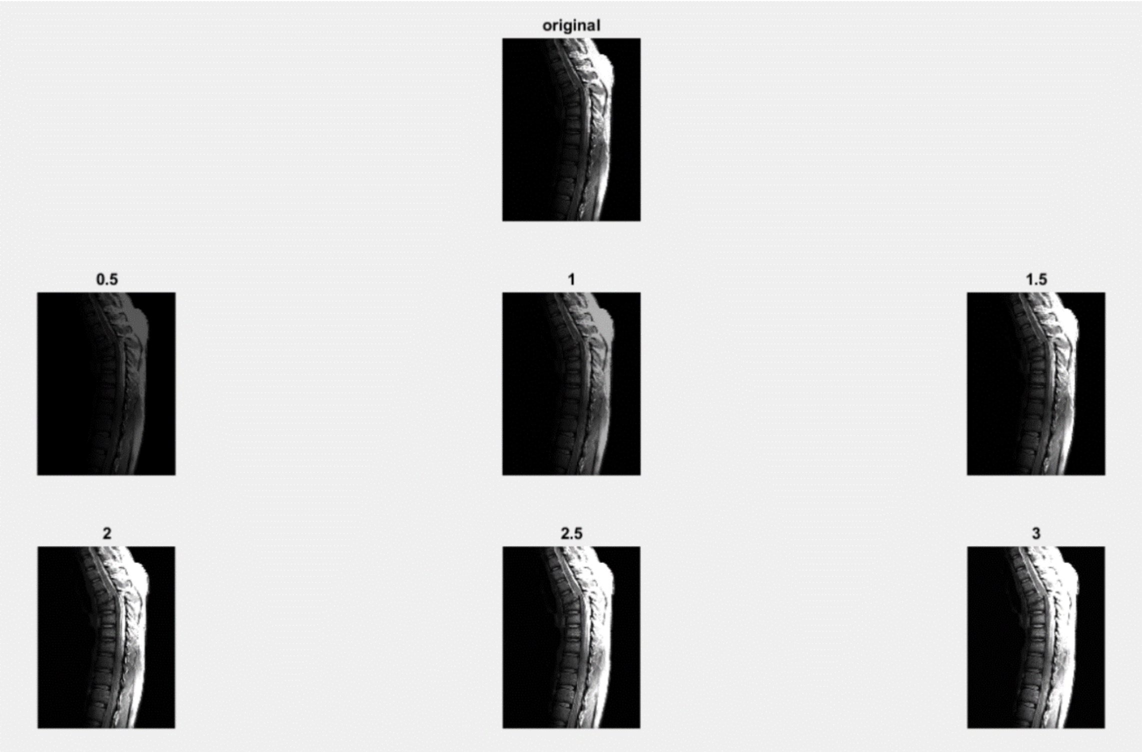
1. Read the image using imread().
2. Convert the image to double using im2double().
3. Apply the log transformation and power log transformation formula on the image.
4. Observe the output.

Code:

```
I = imread('spine.jpg');
Id = im2double(I);
In = Id;
figure;
subplot(3,3,2),imshow(I),title('original');
z = 4;
for c = .5:.5:3
[M,N]=size(Id);
        for x = 1:M
            for y = 1:N
                In(x,y)=c*log(1+Id(x,y));
            end
        end
subplot(3,3,z),imshow(In),title(c);
z=z+1;
end
In = Id;
```

```
c = input('Enter the value of c : ');
r = input('Enter the value of r : ');
[M,N]=size(Id);
figure;
subplot(1,2,1),imshow(I),title('original');
        for x = 1:M
            for y = 1:N
                In(x,y)=c*Id(x,y)^r;
            end
        end
subplot(1,2,2),imshow(In),title('After');
```

Output:



Exercise 3.

Problem Statement:

i- Run MATLAB. Open the documentation help and look for Histogram Equalization. Read also about Contrast-Limited Adaptive Histogram Equalization.
ii- Write the code for a histogram equalization of the image spine.jpg. Does this improve the look of the image?
Explain
iii- Try to enhance the image with the Contrast-Limited Histogram Equalization. Does the image
quality improve? Estimate the number of 'tiles' for a subjective improvement.

Explanation:

The problem is to read the given image. From grayscale image, we have to change it to a blue image. Then we have to change the color gradually from black to green to yellow to white for given range of pixel value.

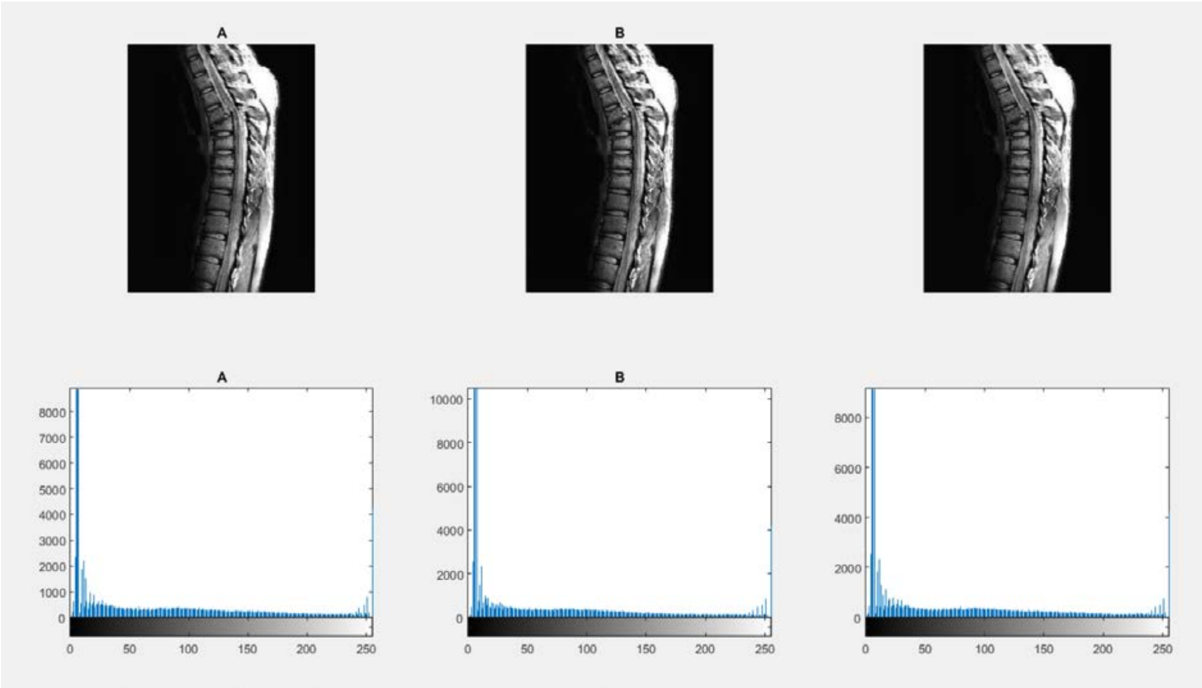
Procedure:

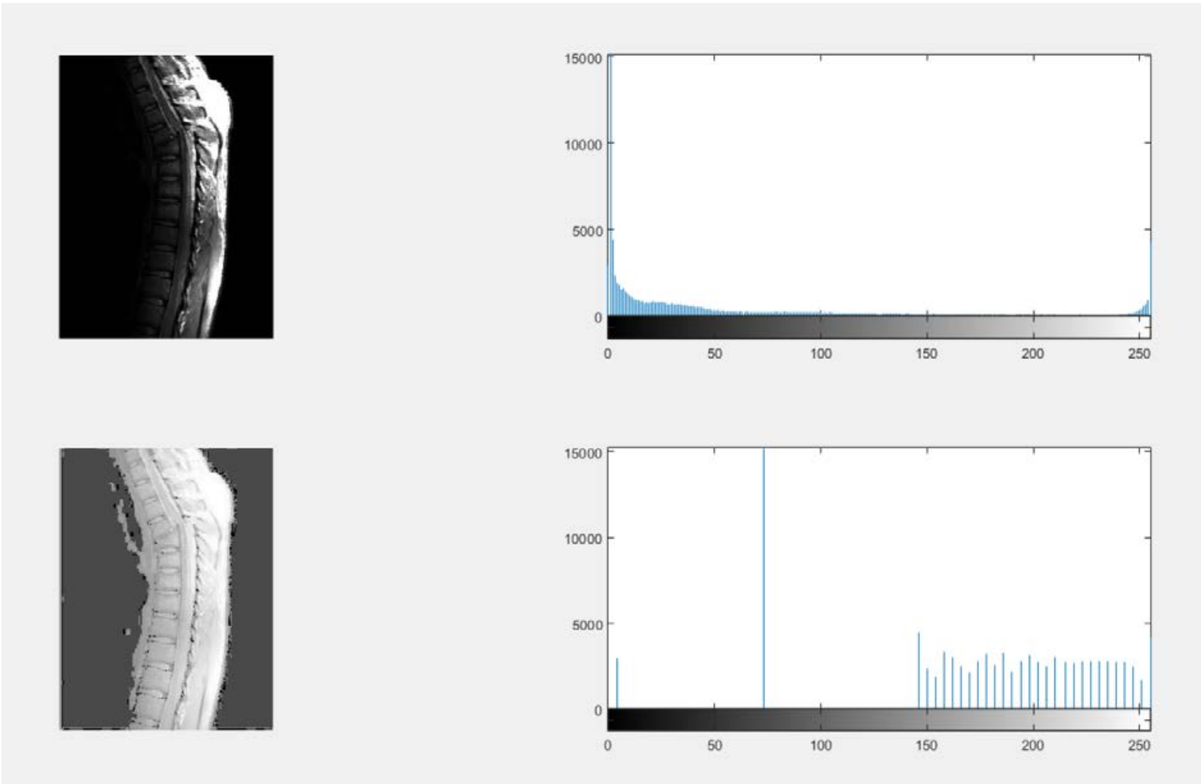
1. Read the image using imread().
2. Convert the image to gray image using rgb2gray().
3. Apply histeq() on the image for histogram equalization.
4. Observe the output.

Code:

```
I = imread('spine.jpg');
I = rgb2gray(I);
I2 = histeq(I);
subplot(2,2,1),imshow(I);
subplot(2,2,2),imhist(I);
subplot(2,2,3),imshow(I2);
subplot(2,2,4),imhist(I2);
figure;
A = adapthisteq(I);
subplot(2,3,1),imshow(A),title('A'),subplot(2,3,4),imhist(A),t
itle('A');
A = adapthisteq(I,'Numtiles',[16 16]);
subplot(2,3,2),imshow(A),title('B'),subplot(2,3,5),imhist(A),t
itle('B');
A = adapthisteq(I,'Numtiles',[4 8]);
subplot(2,3,3),imshow(A),subplot(2,3,6),imhist(A);
```

Output:


A
B
A
B
0 1000 2000 3000 4000 5000 6000 7000 8000
0 2000 4000 6000 8000 10000
0 2000 4000 6000 8000
0 50 100 150 200 250


0 5000 10000 15000
0 50 100 150 200 250

Exercise 4.

Problem Statement:

i- Download the image rocks.jpg. Convert the image to RGB. Histogram equalize the R, G, and B images separately using the histogram equalization program and convert the image back to jpg format.
ii- Form an average histogram from the three histograms in (i) and use it as the basis to obtain a single histogram
equalization intensity transformation function. Apply this function to the R, G, and B components individually, and
convert the results to jpg. Compare and explain the differences in the jpg images in (i) and (ii)

Explanation:

The problem is to Form an average histogram from the three histograms and use it as the basis to obtain a single histogram.

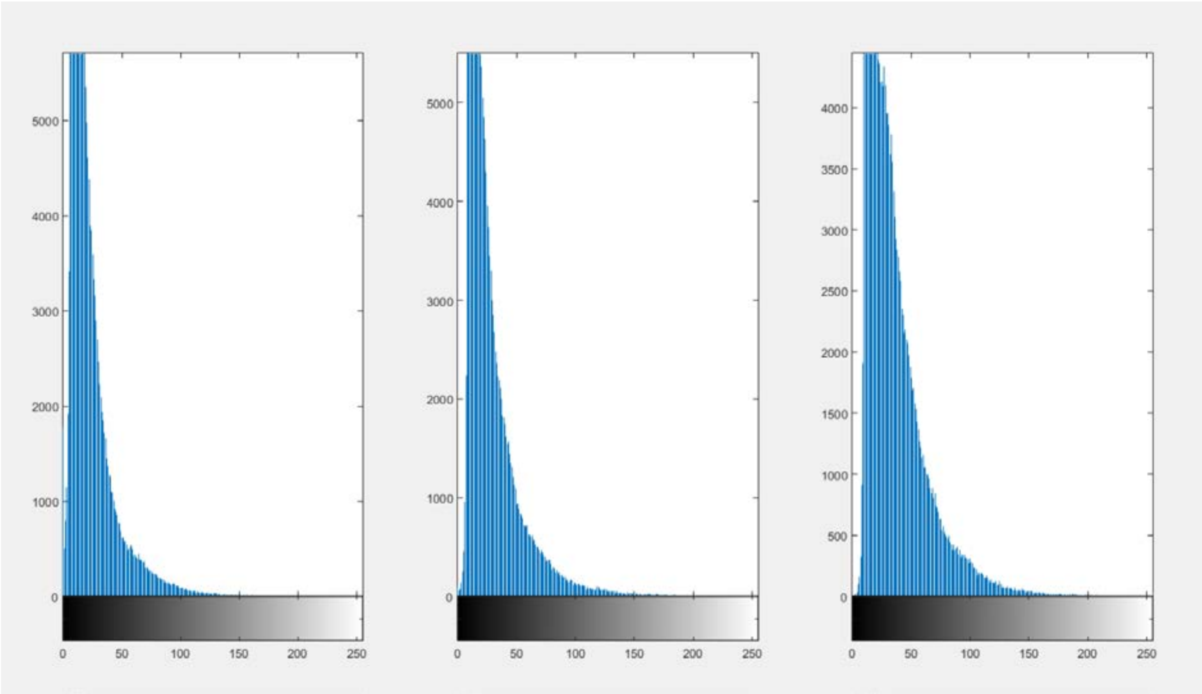
Procedure:

1. Read the image using imread().
2. Separate the image into three layers Red, Green and Blue.
3. Apply histeq() on the image for histogram equalization.
4. Apply catenation on the three layer of image.

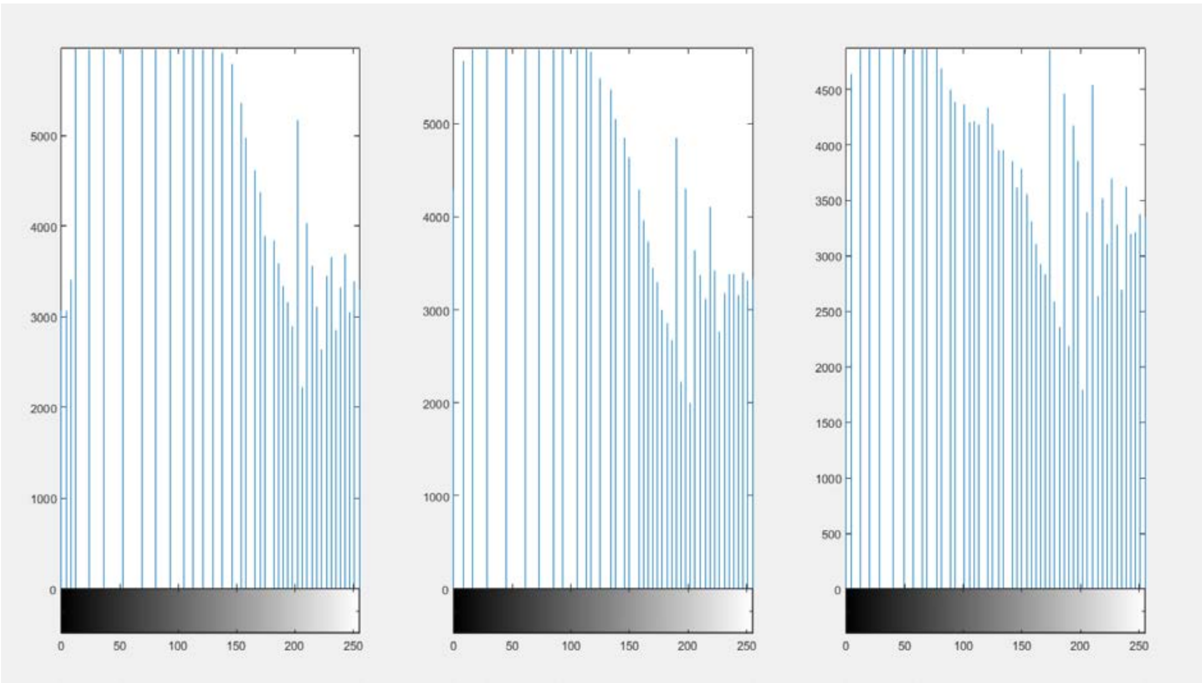
Code:

```
I = imread('rocks.jpg');
imshow(I);
R = I(:,:,1);
G = I(:,:,2);
B = I(:,:,3);
figure;
subplot(1,3,1),imhist(R);
subplot(1,3,2),imhist(G);
subplot(1,3,3),imhist(B);
R = histeq(R);
G = histeq(G);
B = histeq(B);
figure;
subplot(1,3,1),imhist(R);
subplot(1,3,2),imhist(G);
subplot(1,3,3),imhist(B);
figure;
I = cat(3,R,G,B);
imshow(I);
```

Output:



5000
4000
3000
2000
1000
0
0 50 100 150 200 250
5000
4000
3000
2000
1000
0
0 50 100 150 200 250
4000
3500
3000
2500
2000
1500
1000
500
0
0 50 100 150 200 250



5000
4000
3000
2000
1000
0
0 50 100 150 200 250
5000
4000
3000
2000
1000
0
0 50 100 150 200 250
4500
4000
3500
3000
2500
2000
1500
1000
500
0
0 50 100 150 200 250