EE475 HW-2

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QUESTION-2

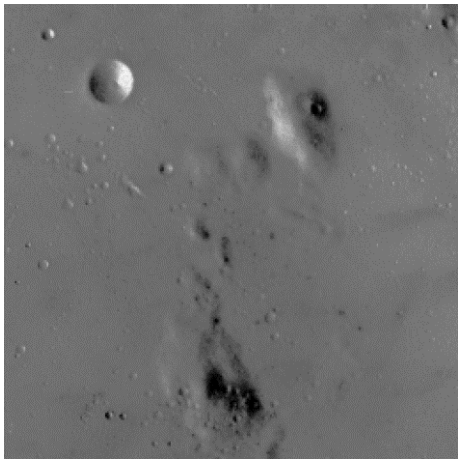
Lumbercamp Image

Equalized Lumbercamp with my function

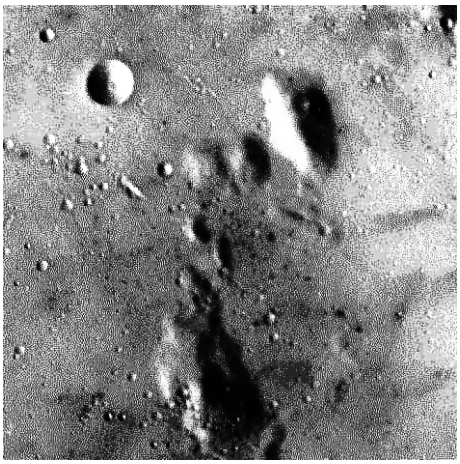
Equalized Lumbercamp with histeq.m

Equalized Lumbercamp with adapthisteq.m

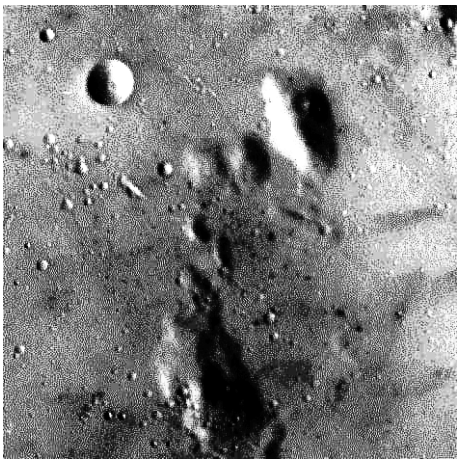
By equalizing the image, the contrast of the image increases. We can easily check it from the contrast difference between normal image and equalized image. The contrast of the image that equalized with 'histeq.m' is greater than the contrast of the image equalized by 'adapthisteq.m'. But the quality of the image is better by adaptive equalizing. For instance, shirt and the faces of the people can not be easily separate in equalized image. On the other hand, the image that equalized adaptively is more real and separable for human eye although it has less contrast. Moreover, my equalization function and 'histeq.m' gives very similar results, not the same. These are the same according to human eye.



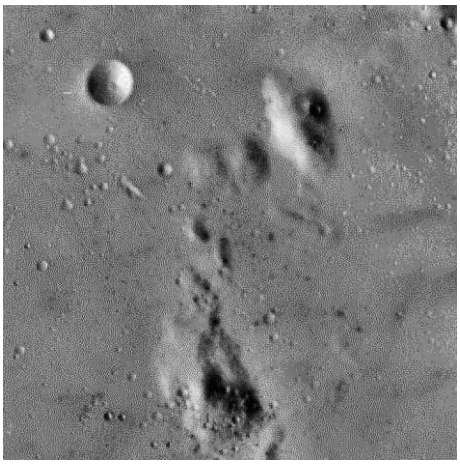
Moon Image



Equalized Moon with my function



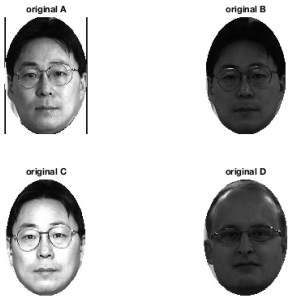
Equalized Moon with histeq.m



Equalized Moon with adapthisteq.m

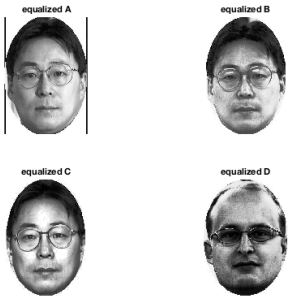
In my opinion, the image that equalized with 'histeq.m' is better than the image equalized by 'adapthisteq.m'. Latter consists almost the same color and to separate something is more diffucult. We can better see the depth of the points on the image equalized. Generally, we obtain better image by equalizing the image adaptively. Because, this method divides the image into small rectangles and increase the contrast of the each rectangle. This makes image better for human eye. However, if we want to detect the fast increasing places, 'histeq.m' is better than 'adapthisteq.m'.

QUESTION-3



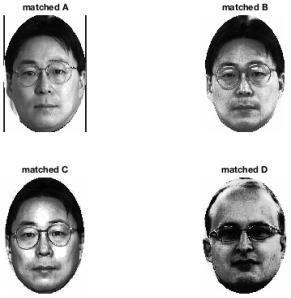
Normal Image

The images was RGB form, i changed it to grayscale. Then, i do operation to grayscaled image.



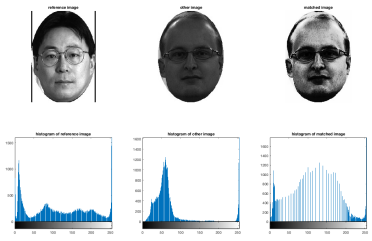
Equalized Images

By equalizing the images, we obtain more flat histogram and also more contrast images. Especially, the images B and D become better. The faces are now more clear for the images B and D. The changes at the images A and C are limited, because these images have already great contrast.



Matched Images

There is no big difference between matched images and equalized images. In my opinion, it is because the reference image is approximately equalized. So equalizing the images and matching images with reference A has similar effect. However, the matching image D to image A is very bad. Because the histogram of image D is mostly left sided, so after matching we lost many contrast difference. This explanation for disrupting D after matching can easily be easily seen by the figure below:



Matched Images

Chi-square Histogram Distance

Chi-square histogram distance between normal image is:

	A	B	C	D
A	0	0.7179	0.3310	0.7101
B	0.7179	0	0.7993	0.4128
C	0.3310	0.7993	0	0.7865
D	0.7101	0.4128	0.7865	0

Chi-square histogram distance between equalized image is:

	A	B	C	D
A	0	0.7556	0.5035	0.7487
B	0.7556	0	0.7862	0.8524
C	0.5035	0.7862	0	0.7982
D	0.7487	0.8524	0.7982	0

Chi-square histogram distance between matched image is:

	A	B	C	D
A	0	0.6497	0.3670	0.6111
B	0.6497	0	0.6938	0.7307
C	0.3670	0.6938	0	0.6524
D	0.6111	0.7307	0.6524	0

First of all, i didnt use the histogram count value to find distance. Because one image can have more pixels than the other. For example, assume that the size of one image is 512*512 and the size of another is 1024*1024. Comparing these two image according to their histogram count cannot be fair, therefore to find distance i use pdfs of the histogram. By this way, we obtain normalized distances between the images.

Matching images to image A should reduce the distance between the image A and that image. For example, the distance between {B,C} and A was 0.7179, after matching the distance is 0.6497. However, the distance between C and A increases after matching C to A. I do not know why it is but it is interesting. Because matching something to another should make similar.

Kullback-Leibler Distance

Kullback-Leibler histogram distance between normal image is:

	A	B	C	D
A	0	2.4645	0.3694	2.1966
B	2.4645	0	3.4681	0.9073
C	0.3694	3.4681	0	3.1988
D	2.1966	0.9073	3.1988	0

Kullback-Leibler histogram distance between equalized image is:

	A	B	C	D
A	0	4.0573	1.8344	3.7608
B	4.0573	0	4.6129	6.5751
C	1.8344	4.6129	0	4.5463
D	3.7608	6.5751	4.5463	0

Kullback-Leibler histogram distance between matched image is:

	A	B	C	D
A	0	2.6371	0.8159	2.1891
B	2.6371	0	3.6111	4.7359
C	0.8159	3.6111	0	2.7754
D	2.1891	4.7359	2.7754	0

After matching the images to reference image A, makes the distance between these image and image A

great. In my opinion, the chi-square distance is better calculation method for matching operation. The changes can easily checked from the there.

QUESTION-4

Question-4a

Equalized Kugu Image

The kugu is approximately the same after equalization, because kugu consists mostly white pixels and after equalization these pixels will be still white. Background was mostly shadow before equalization. Histogram was mostly on the left side and by equalization we obtain flat histogram. Therefore, background is more clear after equalization.

Equalized Beach Image

The image beach is a simple image. The diversity of the color is low. By equalizing the image, we increased the diversity of the color in the image. It makes image like art and it is not like a real image. So we can conclude that if the diversity of the image color is high, equalization makes the image better. However, if the image consists of less color, equalization disrupt the image.

Question-4b

Equalizing only Intensity of the Kugu

Equalizing only Intensity of the Beach

Question-4c

Equalizing only Saturation of the Kugu

Equalizing only Saturation of the Beach

Question-4d

HSV form consist of 3 component. These are hue, value(intensity) and saturation. Value represents dimension of lightness and darkness. In the aspect of lightness, the image kugu has greater diversity, so the equalization of value part makes the image more clear. In contrast to image kugu, the image beach approximately same lightness on the majority of the pixels. Therefore, equalization of the value component makes this image disrupted. Because the change will be too much in the image beach.

Saturation is essentially the depth of the pigment. It describes how pure/intense/strong the hue is. Therefore, equalizating the saturation makes the edges more clear. For example on the image beach, blue pixels are more blue, yellow olaces are more yellow. So the places can easily determined after equalizating the saturation component.