Indian Institute of Technology Tirupati

Image Processing Lab

Lab sheet. No: 02

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Q1. **Gamma (γ) Correction:**

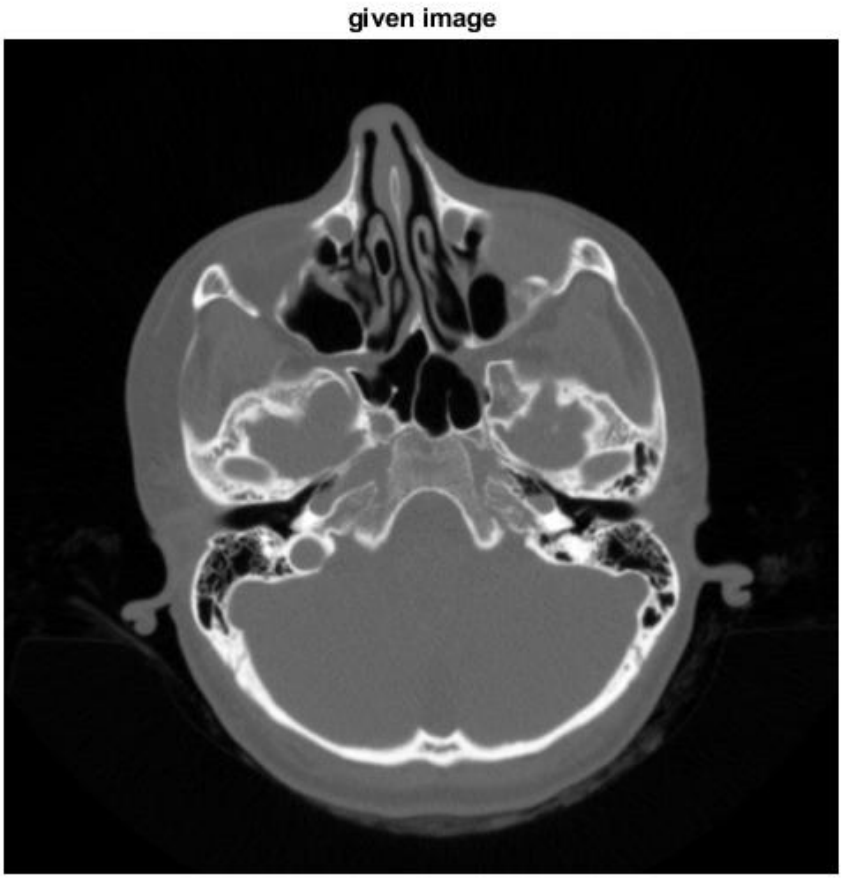
Write your own MATLAB function to perform γ-correction on a given image.

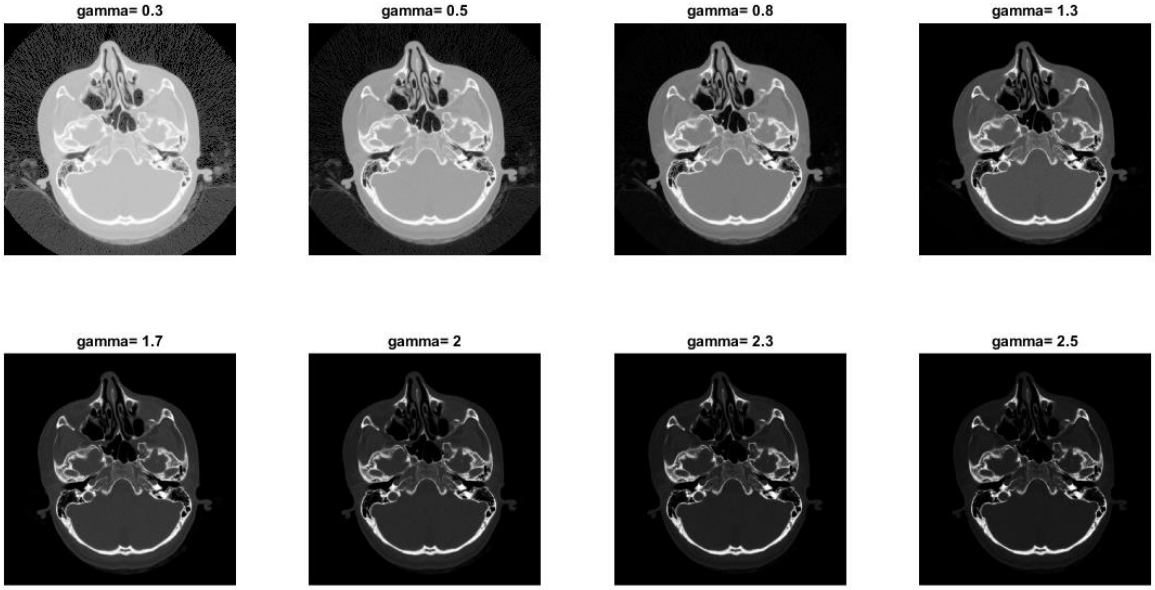
Input Images: skull.jpg, xray.png

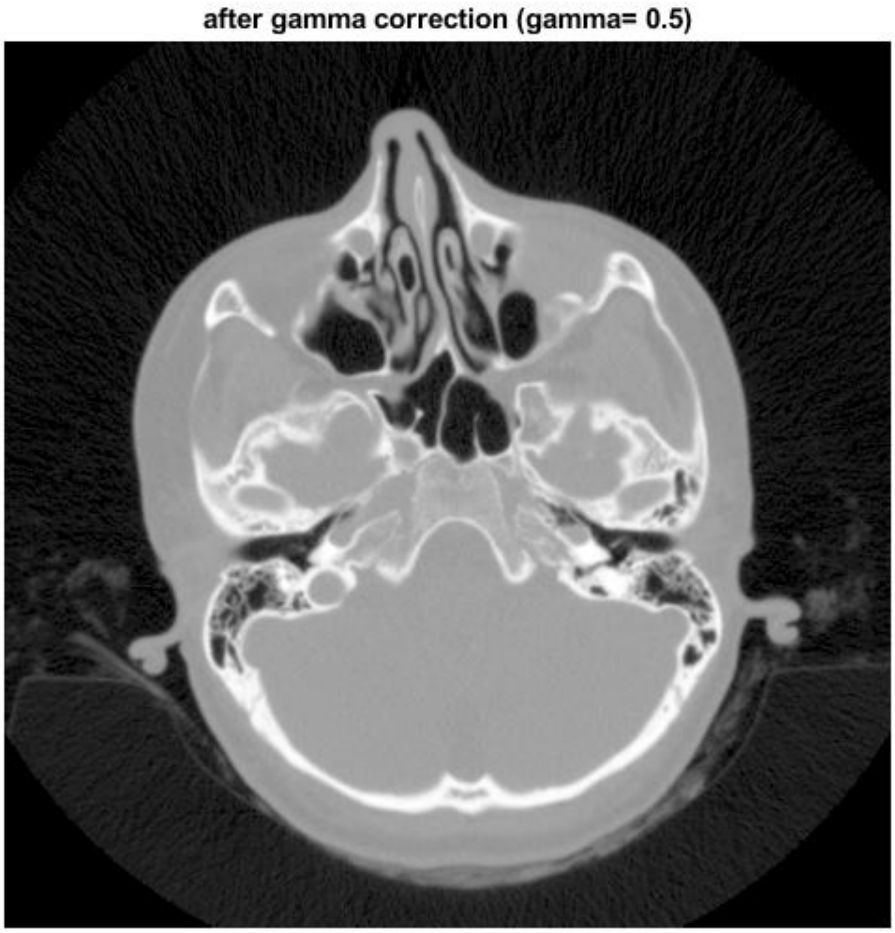
The inputs to the function should be (i) given image and (ii) γ value. The output should be a γ-corrected image. Apply this transform to both the input images for varying values of γ and clearly specify your inferences from these results.

Aim: To apply the gamma correction to the given input images and display the resultant image, using functions.

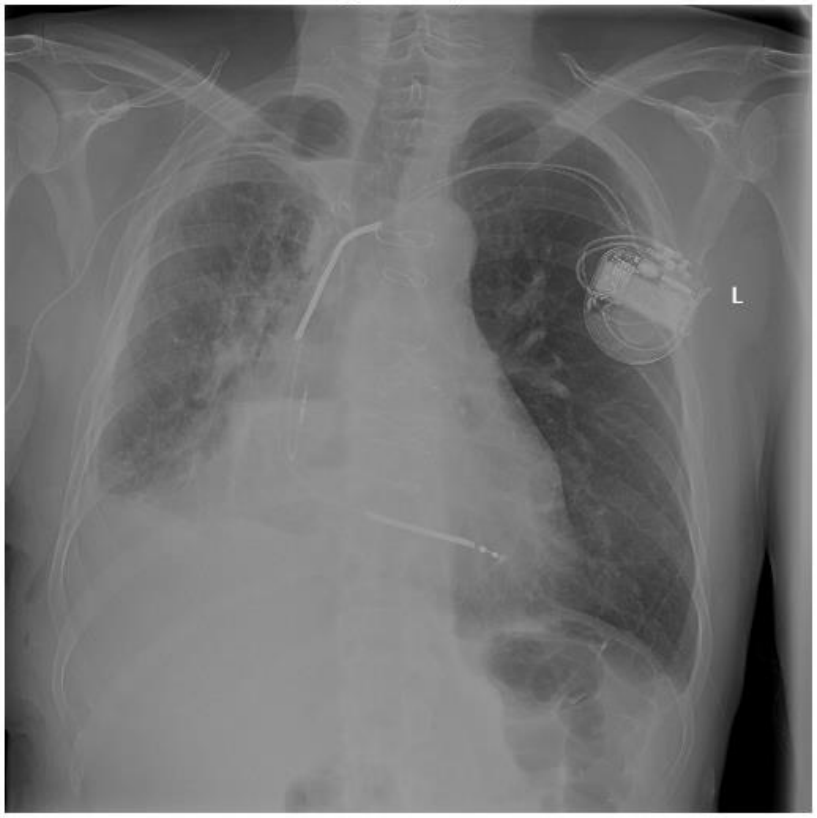
Output:




gamma= 0.3
gamma= 0.5
gamma= 0.8
gamma= 1.3
gamma= 1.7
gamma= 2
gamma= 2.3
gamma= 2.5


after gamma correction (gamma= 0.5)

given image



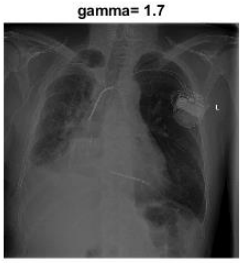
gamma= 0.4

gamma= 0.5

gam

gamma= 1.3

gamma= 1.7

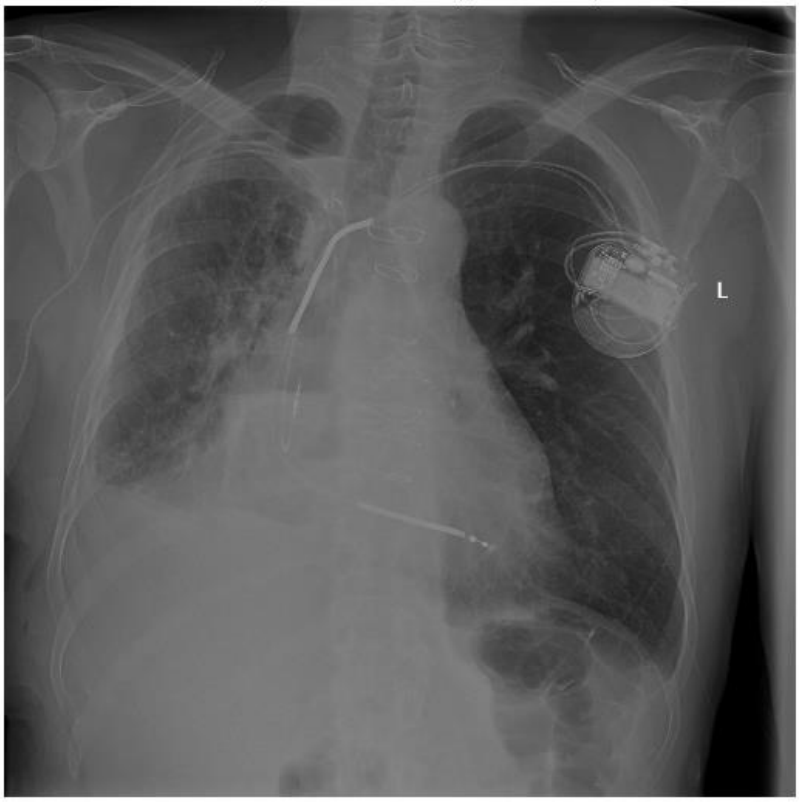


gamma= 2

gamma= 2.3

gamma= 2.5

after gamma correction (gamma= 1.3)



Inferences:

1. 'Skull.jpg" is having high contrast (less value of pixel intensities), gamma correction by using gamma less than 1 , we can map the some of the low intensity values to wide range of high intensity values. So the resultant image after the gamma correction little bit enhanced from the high contrast image.
2. When the **gamma** is reduced too much, the image begins to reduce contrast to the point where the image started to have very slight **wash-out** look, especially in the background. So it is not desirable. In our case of "skull.jpg" image the acceptable range of gamma = 0.6 to 0.4.
3. "xray.png" is having low contrast (less value of pixel intensities), gamma correction by using gamma greater than 1 , we can map the some of the high intensity values to wide range of low intensity values. There is no significant change in the low values intensities So the resultant image after the gamma correction little bit enhanced from the low contrast image.
4. When the **gamma** is increased too much, the image begins to increased contrast to the point where the image started to become dark So it is not desirable.
   In our case of "xray.png" image the acceptable range of gamma = 1.3 to around 2.0.

Q2. **Thresholding based Segmentation:**

Write your own MATLAB program to perform global thresholding to segment a given image. The inputs should be (i) given image and (ii) Threshold value.

(a) Input Images: coins.jpg

By selecting a suitable threshold value, separate the coins from the background.

Display (i) Histogram of the image (ii) Thresholded image

(b) Input Images: numbers.jpg

By selecting suitable threshold values, display

(i) All the numbers in white (255) and the background in black (0).

(ii) All the numbers in black (0) and the background in white (255).

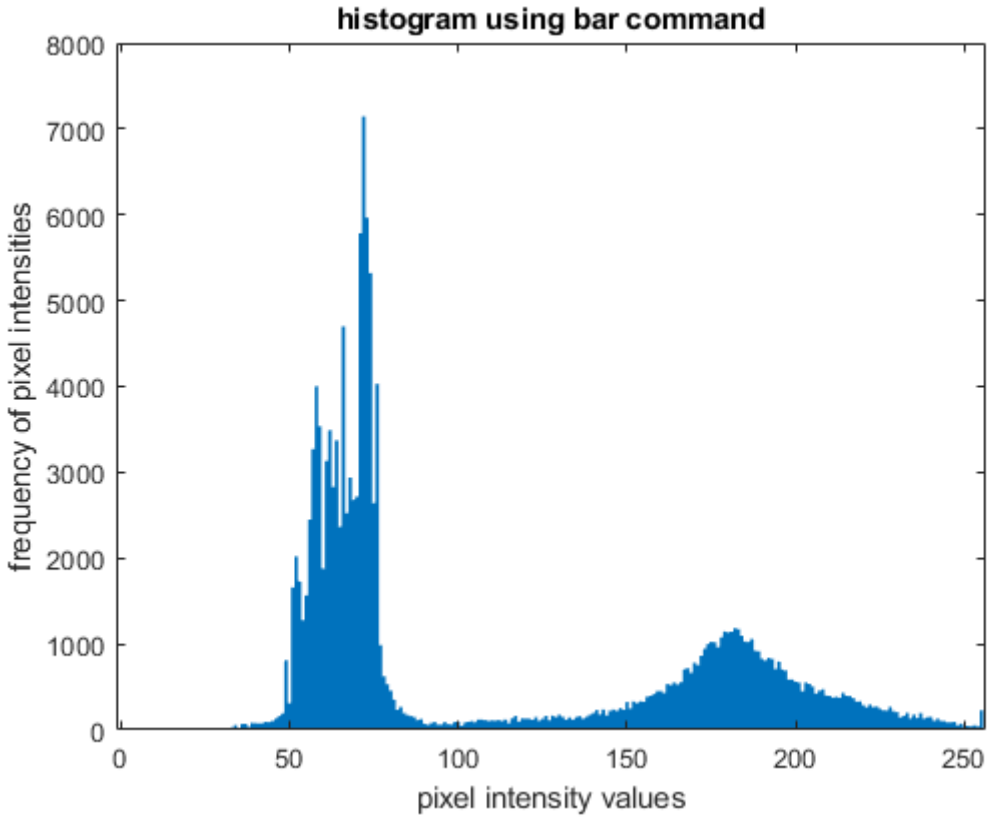
(iii) Only a few numbers and make others disappear.

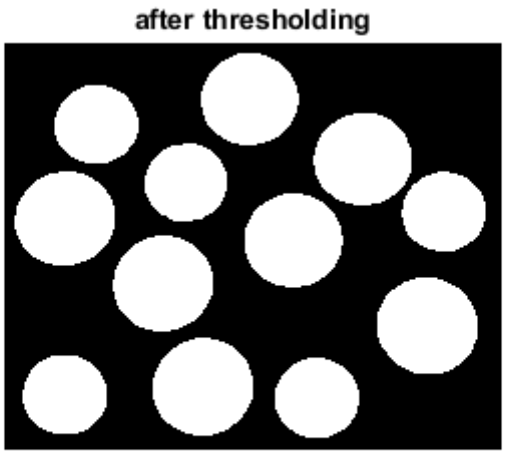
Mention the threshold values fixed for each case and write the inferences.

Aim: To display the histogram for the given input image and To apply the thresholding to separate the coin , numbers from the background .

Output:

given image





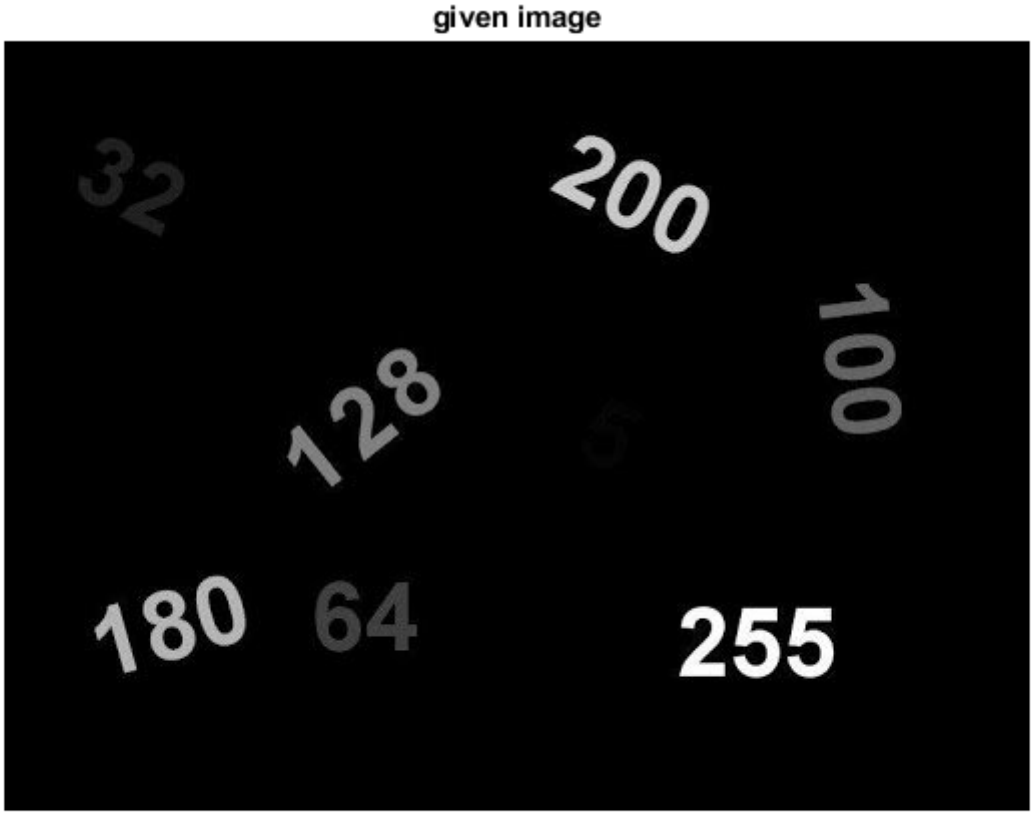
Q2(a)

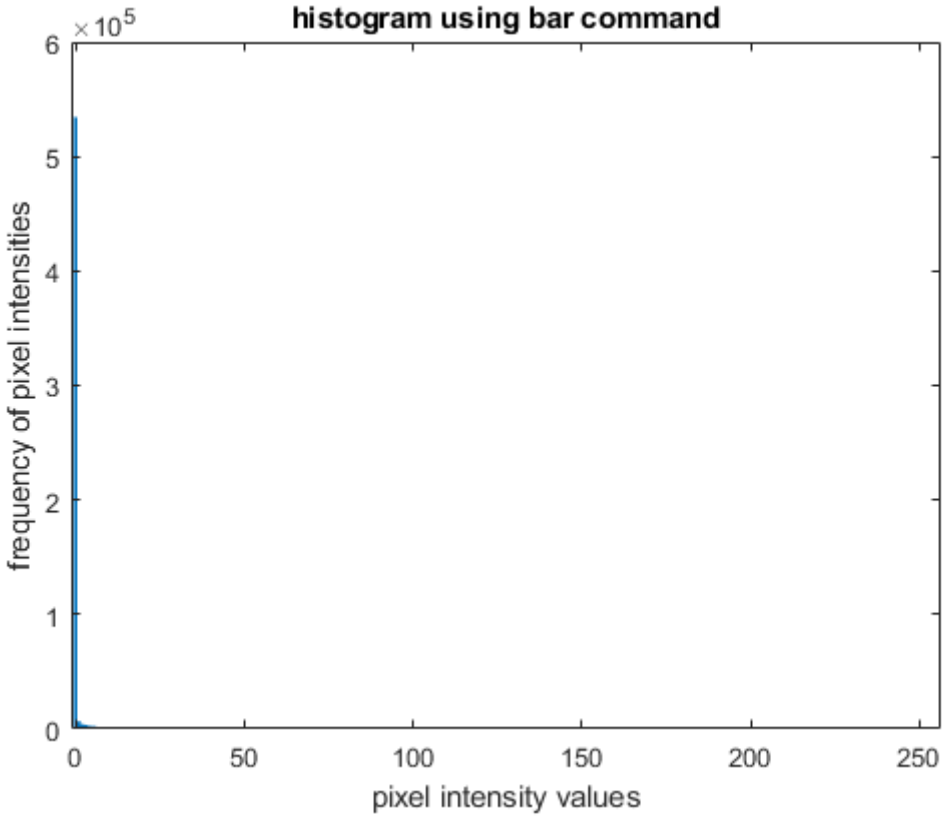
Inferences:

1. By looking at the histogram of a given image, the threshold value is around 100 to segment the coins from the background.
2. I assigned the 0 intensity below the threshold value and 255 intensity above threshold value. So that coin is separate(remove) from the background.
3. After thresholding some of the pixels of below threshold values are inside the coin so to remove those pixels I used **median filter**.

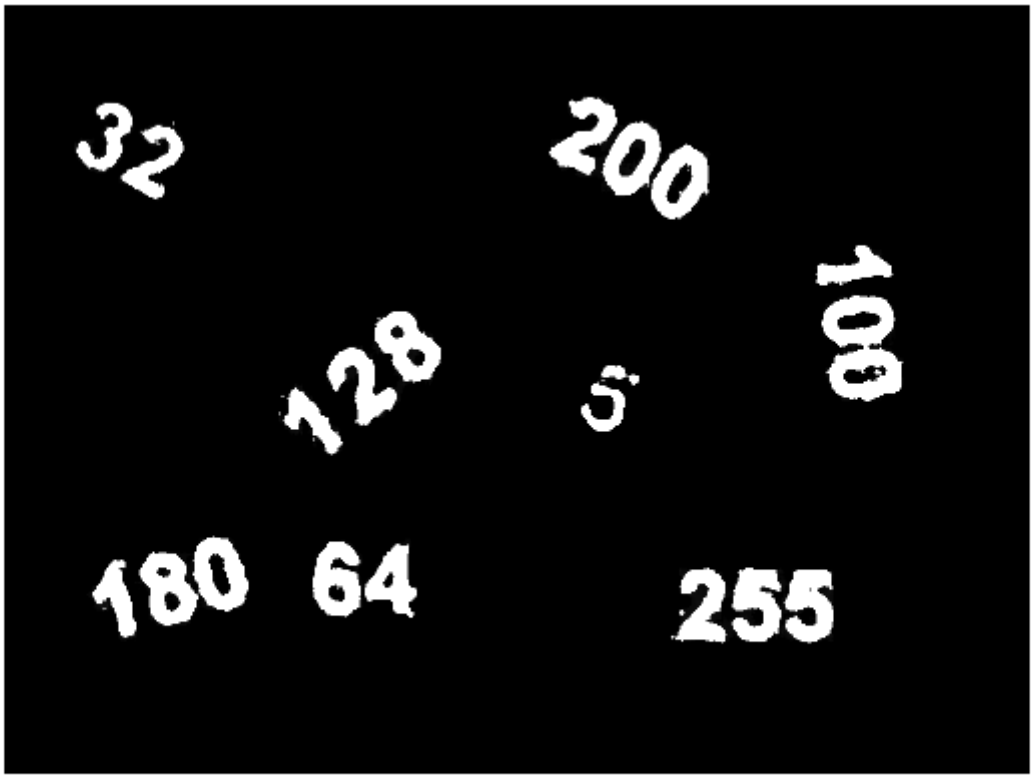
2(b):

Output:

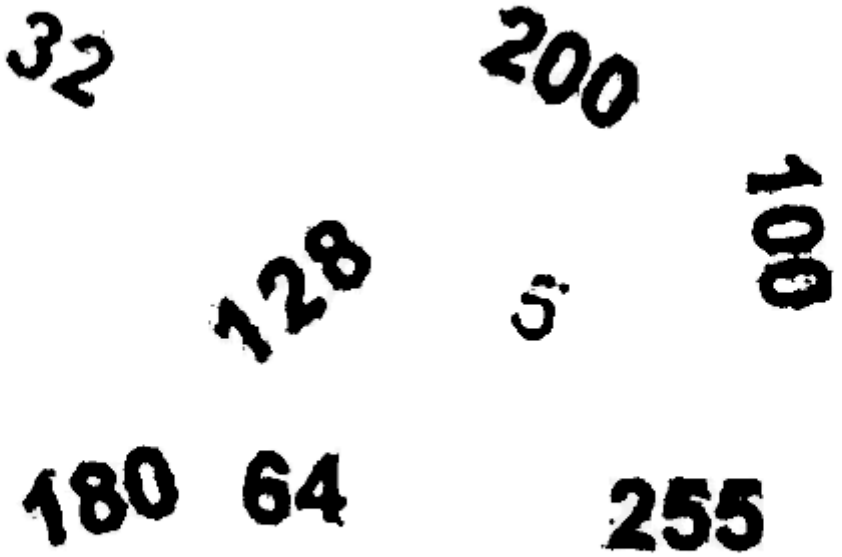

given image
32
200
100
128
180
64
255

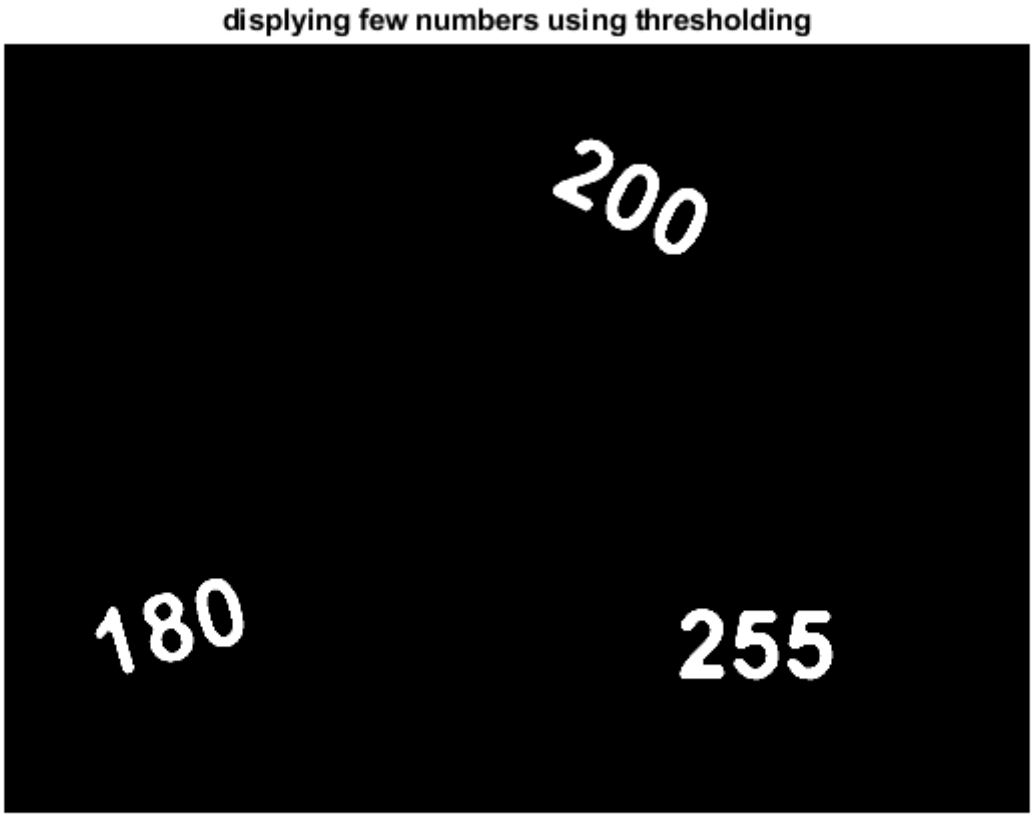

histogram using bar command
×10^5
6
5
4
3
2
1
0
frequency of pixel intensities
0
50
100
150
200
250
pixel intensity values

after thresholding



numbers in black colour





2(b)

Inferences:

1. The given image contains the numbers **5,32,64,100,128,180,200,255.**
2. The number 5 having the pixel intensity range between 3 to 7. And the remaining all numbers are having pixel intensity above 25 value.
3. So we can select the threshold value as 3. But the problem is some of the numbers are disturbed due to neighbouring pixels of the number, so the numbers are not shown perfectly. So we can use multiple threshold values selectively to get the numbers shown perfectly.
4. Even if we select multiple threshold values, some salt and pepper noise shown around the numbers. So to remove that we can use median filter so that I can eliminate the noise.
5. To show the background as black and numbers are white, to assign the 0 value to the pixels which are bellow threshold value and 255 to the above threshold values.
6. To show the numbers in black colour and background in white colour, by using negative transform we can achieve it.
7. To show only few numbers in an image, we can choose threshold value hight (ex. 100) such that some of the numbers having low intensity pixels are merged into the background. So 180,200,255 can seen in the given image.

Q3. **Contrast Stretching:**

Write your own program to perform simple contrast stretching. The inputs to the function should be the given image.

Input Image: women.jpg, grains.jpg

For the given input images, display the following and write the inferences:

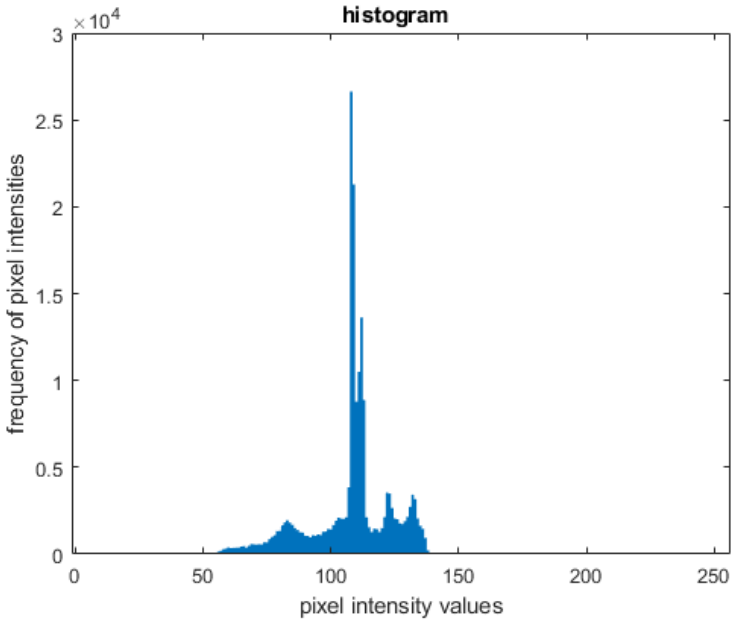
(i) input-histogram,

(ii) Output image after contrast stretching.

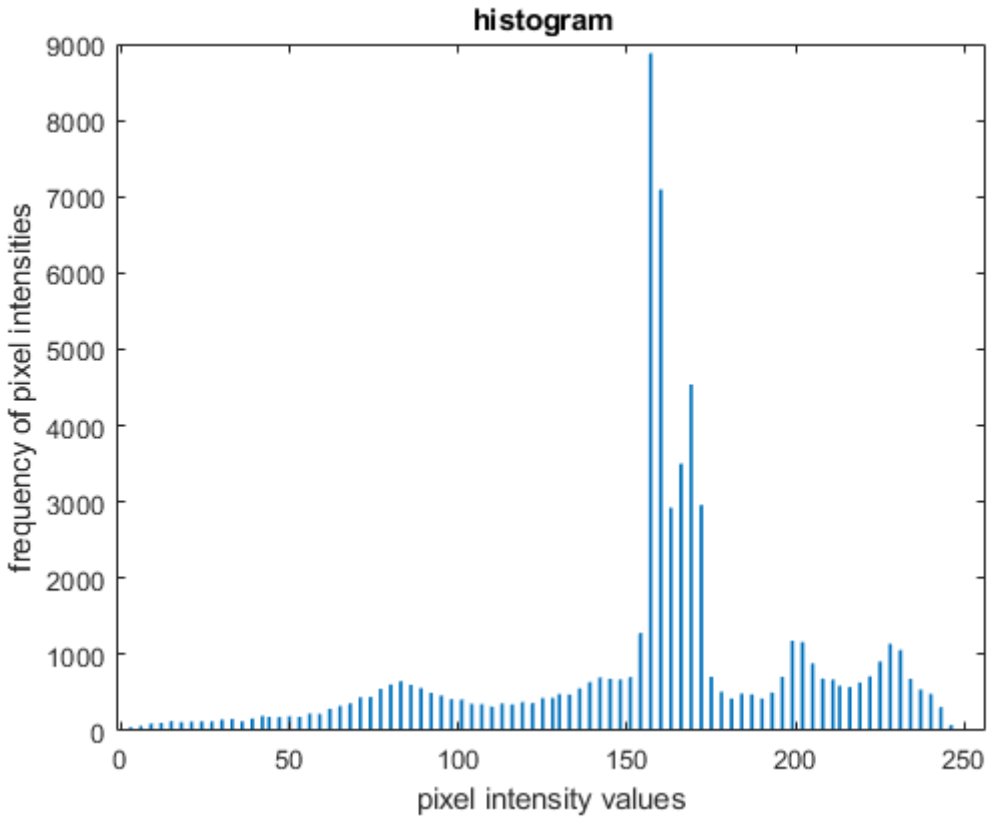
(iii) Output-histogram.

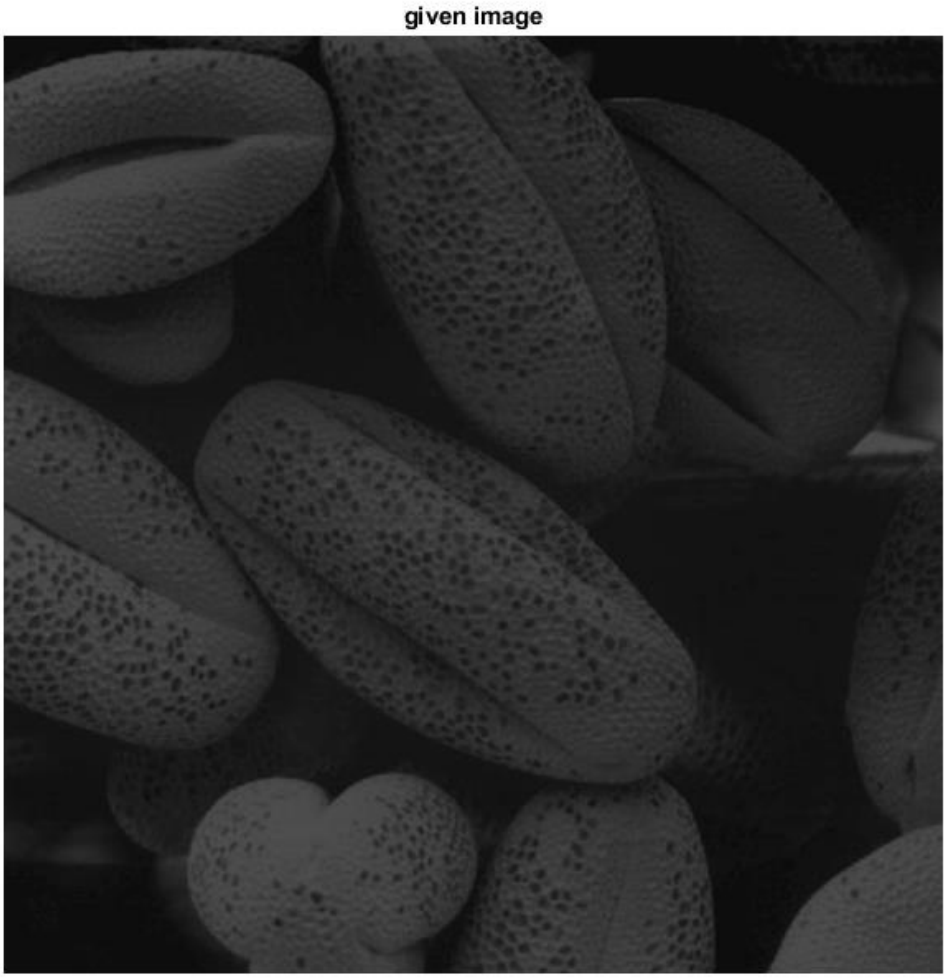
Aim: To perform the contrast stretching for the given input images and display the resultant image and histogram of resultant image.

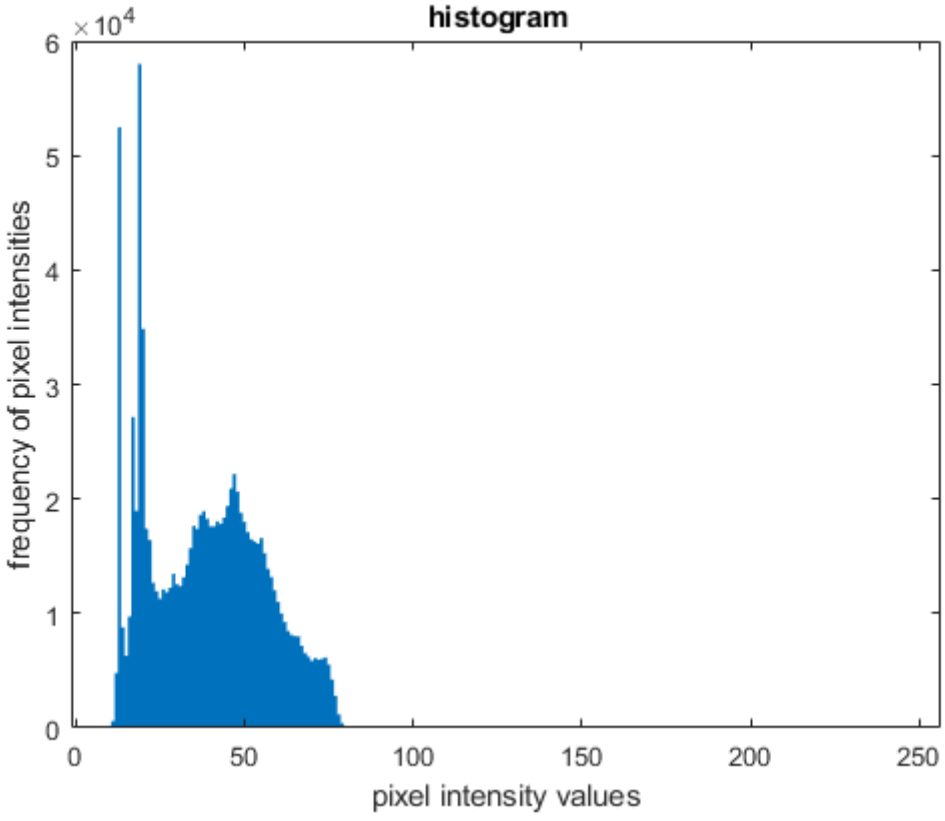
Output:

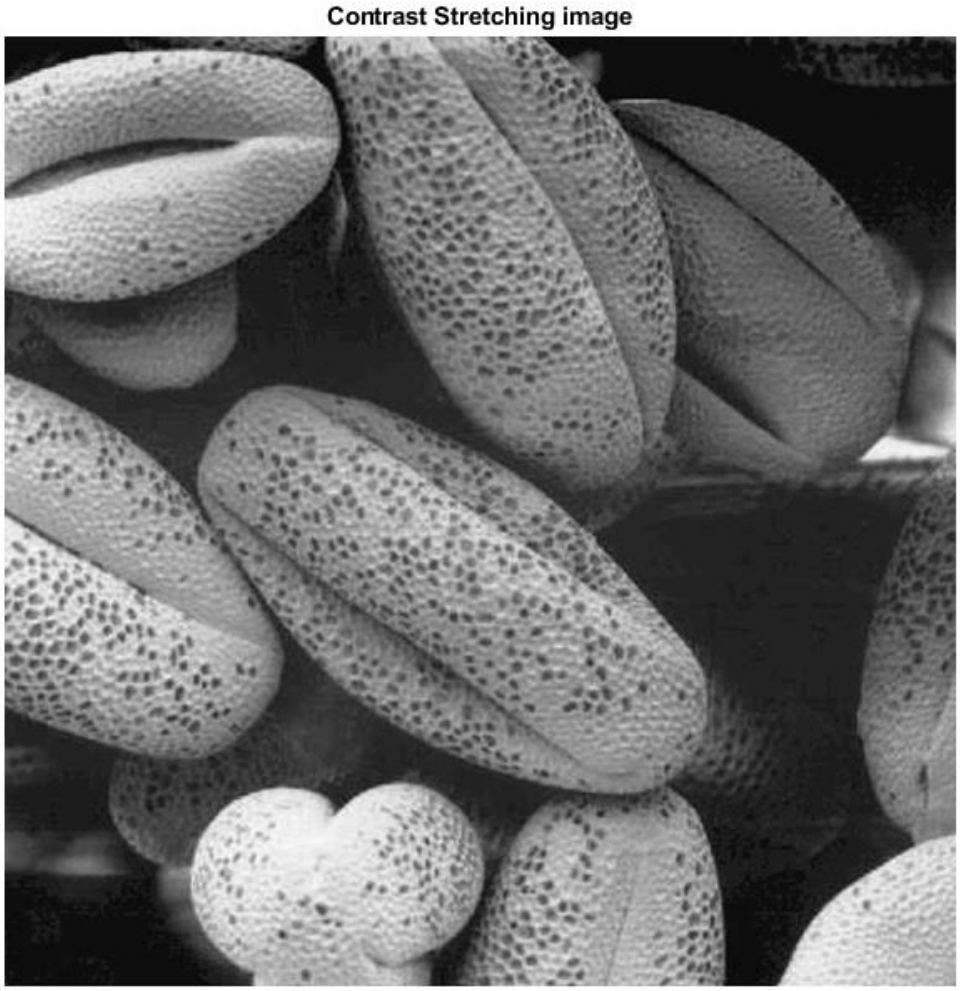


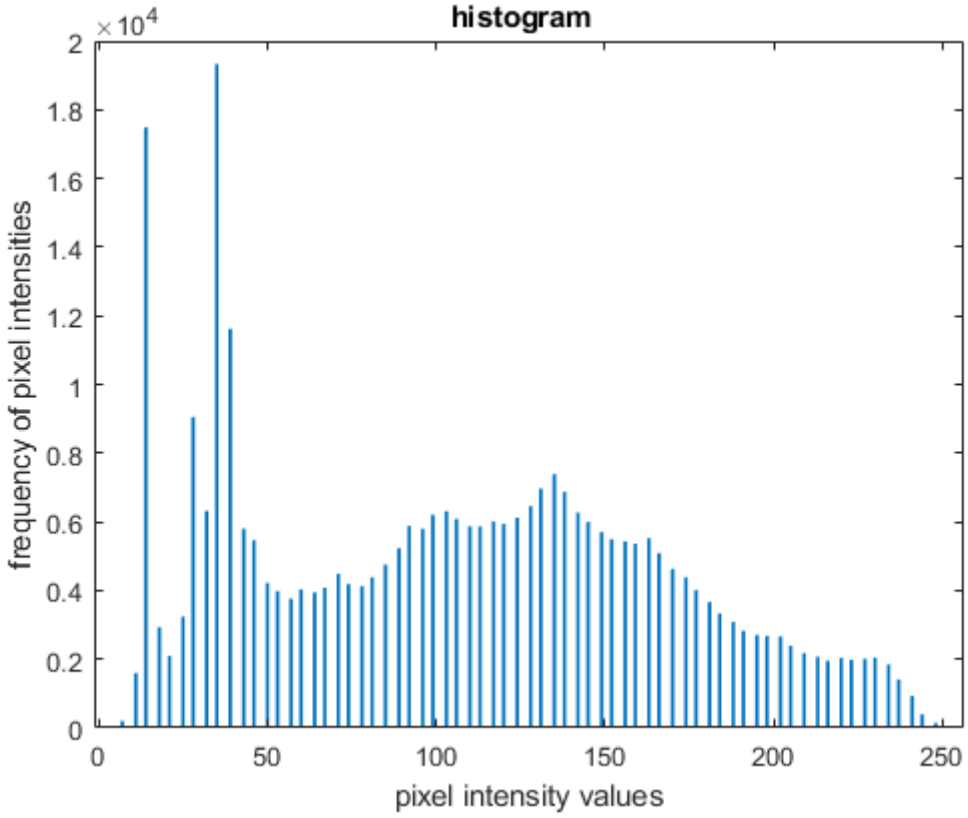

Contrast Stretching image


histogram
frequency of pixel intensities
pixel intensity values
0
1000
2000
3000
4000
5000
6000
7000
8000
9000
0
50
100
150
200
250


given image


histogram
×10^4
6
5
4
3
2
1
0
frequency of pixel intensities
0
50
100
150
200
250
pixel intensity values


Contrast Stretching image


histogram
×10^4
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
frequency of pixel intensities
0
50
100
150
200
250
pixel intensity values

Inferences:

1. If we plot the histogram of a “women.jpg” image, the pixel intensities are in between 55 to 141.
2. The given image After performing the contrast stretching on an image, the intensity levels are distributed though out the range. So the image become enhanced looks brightened . We can clearly observe the intensity level distribution in output histogram.
3. If we plot the histogram of a “ grains.jpg “ image, the pixel intensities are in between 9 to 81.
4. Given gran image is high contrast image, it is dark because of all the pixels are in the range of low intensities only .After performing the contrast stretching on an image, the intensity levels are distributed though out the range. So the image become enhanced looks brightened. We can clearly observe the intensity level distribution in output histogram.