REVIEW QUESTIONS:

1. What is the purpose of image resizing, and how does it affect the image's dimensions?
2. Explain the role of interpolation methods in image resizing, and provide an example of a scenario where resizing is useful.
3. How can you ensure that image quality is maintained when rotating an image in MATLAB?
4. Give an example of an application where image flipping is beneficial.
5. What factors should be considered when assessing the quality of a transformed image?

Ex. No.	HISTOGRAM PROCESSING AND BASIC THRESHOLDING FUNCTIONS	Date

AIM:

The aim of this project is to perform histogram processing and basic thresholding functions on digital images to enhance or segment regions of interest based on their pixel intensity values.

SOFTWARE REQUIRED:

MATLAB 2013b

THEORY:

A histogram is a graphical representation of the distribution of pixel intensity values in an image. It provides insights into the image's contrast, brightness, and distribution of features. Histogram processing refers to operations that modify the pixel intensity distribution in an image. Common processes include contrast stretching, histogram equalization, and histogram matching. Thresholding is a technique used to segment an image into foreground and background regions based on a specific threshold value. Pixels with intensity values above the threshold are classified as foreground, while those below are considered background.

PROCEDURE:

1. Load the digital image you want to process using MATLAB.
2. Compute and display the histogram of the image, representing the frequency of each intensity level.
3. Implement contrast stretching by specifying a lower and upper bound for the pixel intensity values. This expands the range of pixel values, enhancing image contrast.
4. Perform histogram equalization to redistribute pixel intensities across the entire range, which improves the overall image contrast.
5. If needed, match the image's histogram to a predefined histogram to make it similar to a reference image's histogram.
6. Apply a thresholding operation by specifying a threshold value. Pixels with values above this threshold are set to a predefined value (e.g., 255 for white), while those below are set to another predefined value (e.g., 0 for black).
7. Display the original image, histogram, and the processed image after histogram processing and thresholding.

PROGRAM:

%Creating histogram

```
clc;
clear
all;
close
all;
a = rgb2gray(imread('image.jpg'));
[m, n] = size(a);
no = 0:255;
count = 0;
for z=1:256
for i=1:m
for j=1:n
if  a(i, j) == z-1;
count = count + 1;
end
end
end
t(z) = count;
count = 0;
end
figure;
imshow(a)
title('Original image')
figure;
stem(no, t)
grid on;
xlabel('Intesity levels')
ylabel('No. of pixels')
title('Histogram of the image')
```

%Histogram equalization

```
clc
clear
all
close
all
a = rgb2gray(imread('image.jpg'));
[m, n] = size(a);
no_of_pixels = m*n;
figure;
imshow(a)
title('Original image')
h_im = uint8(zeros(m, n));
count = zeros(256, 1);
probf = zeros(256, 1);
```

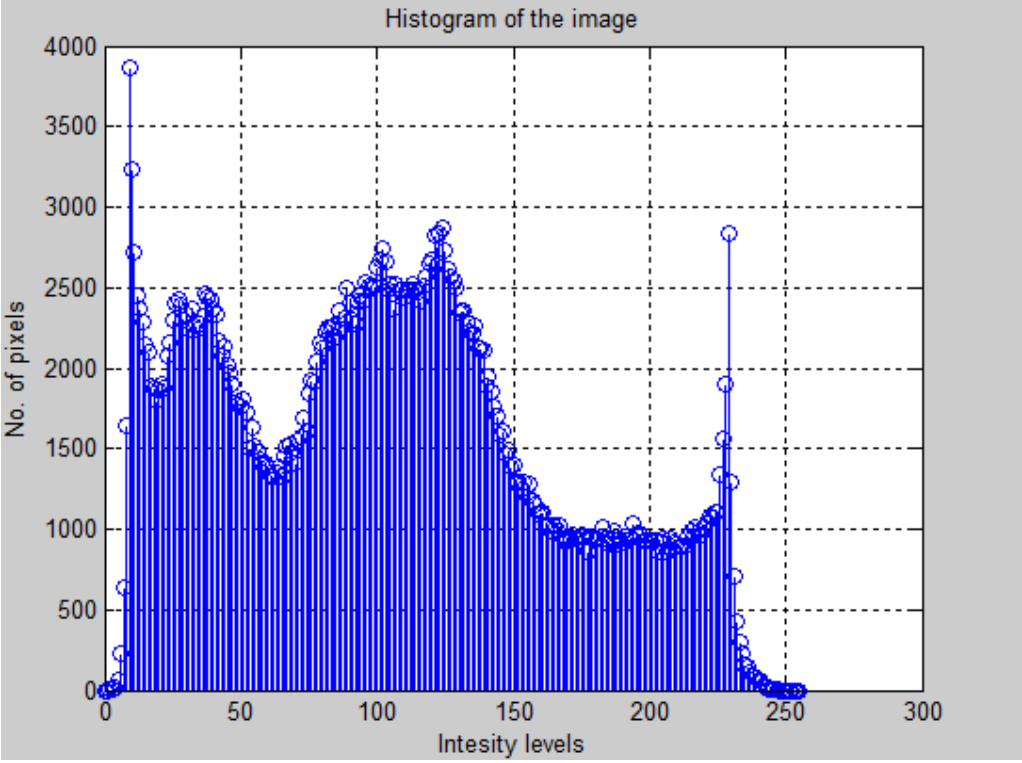
```
probc = zeros(256, 1);
cdf = zeros(256, 1);
output = zeros(1, 256);
no = 1:256;
for i=1:m
for j=1:n
value = a(i, j);
count(value + 1) = count(value + 1) + 1;
probf(value + 1) = count(value +1/no_of_pixels;
end
end
figu
re;
stem(no, probf)
title('Probability distribution function')sum = 0;
b = 255;
for i=1:size(probf)
        sum = sum + count(i);
        cdf(i) = sum;
        probc(i) = cdf(i)/no_of_pixels;
        output(i) = round(probc(i) * b);
end
figu
re;
stem(no, output)
title('Rounded off CDF*(L-1)')
for i=1:m
for j=1:n
  h_im(i, j) = output(a(i, j) + 1);
end
end
figure; imshow(h_im)
title('Histogram equalization')
```

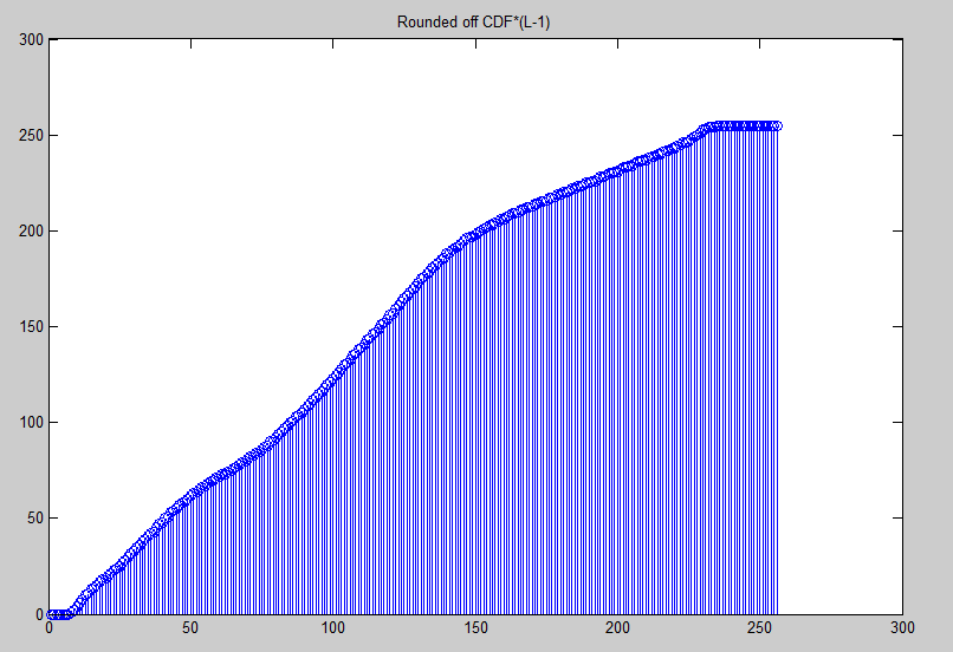
% Thresholding the original image using Otsu's method

```
a = rgb2gray(imread('image.jpg'));
level = graythresh(a);
B = imbinarize(a, level);
subplot(1, 2, 1) imshow(uint8(a))
subplot(1, 2, 2) imshow(B)
```

OUTPUT:


Original image


Histogram of the image
No. of pixels
Intesity levels
0
500
1000
1500
2000
2500
3000
3500
4000
0
50
100
150
200
250
300



RESULT:

REVIEW QUESTIONS:

1. What is a histogram in the context of digital image processing, and why is it useful for analyzing images?
2. Explain the purpose of contrast stretching and histogram equalization in image enhancement.

3. What is the fundamental concept of thresholding, and how is it used to segment regions in an image?
4. How can you determine an appropriate threshold value for thresholding an image?
5. What are the key factors to consider when assessing the quality of an image after histogram processing and thresholding?

Ex. No.	COMPUTATION OF MEAN, STANDARD DEVIATION, CORRELATION COEFFICIENT OF THE GIVEN IMAGE	Date

AIM:

The aim of this experiment is to compute the Mean, Standard Deviation, and Correlation Coefficient of a given image.

SOFTWARE REQUIRED:

MATLAB 2013b

THEORY:

The mean (average) of an image represents the central tendency of pixel intensities in the image. It is calculated by summing up all the pixel values and dividing by the total number of pixels.

Mean (μ) = Σ [I(x, y)] / N

where I(x, y) represents the intensity of the pixel at position (x, y), and N is the total number of pixels in the image. The standard deviation measures the amount of variation or dispersion in pixel intensities. It provides information about the image's contrast and the distribution of pixel values. Standard Deviation (σ) = $\sqrt{[\Sigma [(I(x, y) - \mu)^2] / N]}$

where I(x, y) represents the pixel intensity, μ is the mean, and N is the total number of pixels in the image.

The correlation coefficient measures the degree of linear relationship between two images. It helps to understand how similar or dissimilar two images are. A high correlation coefficient indicates strong positive correlation, while a low coefficient suggests little to no correlation.

Correlation Coefficient (ρ) = $\Sigma [(I_1(x, y) - \mu_1) * (I_2(x, y) - \mu_2)] / [\sqrt{\Sigma}(I_1(x, y) - \mu_1)^2 * \sqrt{\Sigma}(I_2(x, y) - \mu_2)^2]$

where $I_1(x, y)$ and $I_2(x, y)$ are the pixel intensities in two images, μ_1 and μ_2 are the means of the respective images, and the summation is done over all pixels.

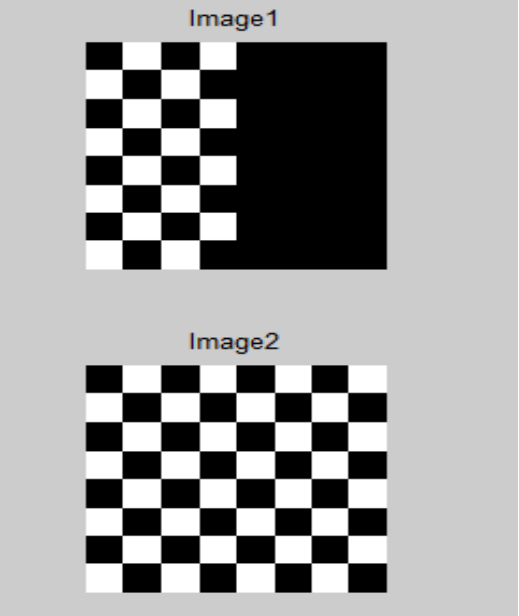
PROCEDURE:

1. Load the given image into your image processing environment MATLAB.
2. Calculate the Mean (μ) of the image using the formula mentioned above. This can be done by iterating through all pixels and accumulating their values.
3. Compute the Standard Deviation (σ) of the image using the formula mentioned above. Again, iterate through all pixels to calculate the necessary values.
4. If you need to compute the Correlation Coefficient between two images, repeat steps 2 and 3 for both images. Ensure that the images are of the same size and resolution.
5. Compute the Correlation Coefficient (ρ) using the formula for correlation mentioned above.

PROGRAM:

```
i=imread('cancercell.jpg');
subplot(2,2,1);
imshow(i);
title('Original Image');
g=rgb2gray(i);
subplot(2,2,2); imshow(g);
title('Gray Image');
c=imcrop(g);
subplot(2,2,3); imshow(c);
title('Cropped Image');
m=mean2(c);disp('m'); disp(m);
s=std2(c); disp('s'); disp(s);
figure, k=(checkerboard>0.8);
subplot(2,1,1); imshow(k);
title('Image1');
k1=(checkerboard>0.5);
subplot(2,1,2); imshow(k1);
title('Image2');
r=corr2(k,k1);
disp('r');disp(r);
```

OUTPUT:



RESULT:

REVIEW QUESTIONS:

1. How is the mean computed for pixel values in an image and what does it represent?
2. What does the standard deviation reveal about an image's pixel values, and how is it calculated?
3. What is the significance of the correlation coefficient in image analysis, and how is it determined for two images?
4. Describe the concept of correlation coefficient as it pertains to image analysis. How is the correlation coefficient calculated for two images, and what does it indicate about their similarity or dissimilarity?
5. How can mean and standard deviation be used to assess the overall brightness and contrast of an image? Provide a step-by-step explanation with a practical example.

Ex. No.	IMPLEMENTATION OF IMAGE ENHANCEMENT-SPATIAL FILTERING	Date

AIM:

The aim of this project is to implement image enhancement using spatial filtering techniques to improve the visual quality of digital images.

SOFTWARE REQUIRED:

MATLAB 2013b

THEORY:

Image enhancement through spatial filtering is a fundamental image processing technique. It involves the use of convolution operations with specific filter kernels to modify pixel values in an image. A basic spatial filter, such as an averaging filter, is used to reduce noise and enhance