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%date - 19/01/2026
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clc;
clear all;
close all;

%load the image
image_matrix = imread('input.jpg');
%display(image_matrix);
imshow(image_matrix);
title('Original Image also Grayscale Image');

figure;

%matlab command to get histogram Equalized image
Ieq=histeq(image_matrix);
imshow(Ieq);
title('Equalized image using matlab histeq command');

figure;

%{
%testing the equalisation code with pre loaded image data
image_matrix = [52      55      61      59      79      61      76      61
62      59      55      104     94      85      59      71
63      65      66      113     144     104     63      72
64      70      70      126     154     109     71      69
67      73      68      106     122     88      68      68
68      79      60      70      77      66      58      75
69      85      64      58      55      61      65      83
70      87      69      68      65      73      78      90];

count_matrix = [
52 1;
55 3;
58 2;
59 3;
60 1;
61 4;
62 1;
63 2;
64 2;
65 3;
66 2;
67 1;
68 5;
69 3;
70 4;
71 2;
72 1;
73 2;
75 1;
76 1;
77 1;
78 1;
79 2;
83 1;
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85 2;
87 1;
88 1;
90 1;
94 1;
104 2;
106 1;
109 1;
113 1;
122 1;
126 1;
144 1;
154 1
];

%}

%calculating the Equalized Image

%forming unique elements matrix
[m,n] = size(image_matrix);

count_matrix_initial = [];

for ii = 1:m
    for jj = 1:n

        val = image_matrix(ii,jj);
        found = 0; % reset for each value

        [x,~] = size(count_matrix_initial);

        for kk = 1:x
            if val == count_matrix_initial(kk,1)
                found = 1;
                break;
            end
        end

        if found == 0
            count_matrix_initial(x+1,1) = val;
        end

    end
end

%arrange the count_matrix in ascending order
[x,~]=size(count_matrix_initial);
count_matrix = count_matrix_initial;
for ii=1:x-1
    for jj=1:x-ii
        if(count_matrix(jj+1,1)<=count_matrix(jj,1))
            temp = count_matrix(jj,1);
            count_matrix(jj,1) = count_matrix(jj+1,1);
            count_matrix(jj+1,1) = temp;
        end
    end
end

%disp(count_matrix);

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%add the count of unique variables
[m,n]=size(image_matrix);
[x,~]=size(count_matrix);
count_matrix(:,2) = 0;
for kk=1:x
    val=count_matrix(kk,1);
for ii=1:m
    for jj=1:n
        if(val == image_matrix(ii,jj))
            count_matrix(kk,2) = count_matrix(kk,2)+1;
        end
    end
end
end

%making the cdf matrix
matrix_cdf = zeros(x,1);
value=0;
for ii=1:x
    value=value+count_matrix(ii,2);
    matrix_cdf(ii,1)=value;
end

%making the histogram equivalent value matrix
hist_val = zeros(x,1);
cdf_min = min(matrix_cdf);
n=size(image_matrix);
for ii = 1:x
    hist_val(ii) = round(((matrix_cdf(ii,1) - cdf_min) / ((n(1)*n(2)) - cdf_min)) * (256 - 1));
end
[m,n] = size(image_matrix);
histeq_mat = zeros(m,n);

for ii = 1:m
    for jj = 1:n

        old_val = image_matrix(ii,jj);

        % find matching value in count_matrix and replace with hist_val
        for kk = 1:x
            if old_val == count_matrix(kk,1)
                histeq_mat(ii,jj) = hist_val(kk);
                break;
            end
        end
    end
end

%disp(histeq_mat);

histeq_mat = uint8(histeq_mat);
imshow(histeq_mat);
title('Equalized image using made functions');

```

**Original Image also Grayscale Image**



**Equalized image using matlab histeq command**



**Equalized image using made functions**

