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% This program performs histogram equalization on a grayscale image.  
% First, histogram equalization is implemented manually without using  
% the histeq() function. Then, the result is compared with MATLAB's  
% built-in histeq() function by displaying both images and their histograms.  
  
clc;  
clear;  
close all;  
  
% Read image  
I = imread('krishna.JPG');  
  
% Convert to grayscale if image is RGB  
if size(I,3) == 3  
    I = rgb2gray(I);  
end  
  
I = uint8(I);  
  
% Manual Histogram Equalization  
[M, N] = size(I);  
L = 256;  
total_pixels = M * N;  
  
hist_manual = zeros(1, L);  
for i = 1:M  
    for j = 1:N  
        hist_manual(I(i,j) + 1) = hist_manual(I(i,j) + 1) + 1;  
    end  
end  
  
pdf = hist_manual / total_pixels;  
cdf = cumsum(pdf);  
T = round((L - 1) * cdf);  
  
I_manual = zeros(M, N, 'uint8');  
for i = 1:M  
    for j = 1:N  
        I_manual(i,j) = T(I(i,j) + 1);  
    end  
end  
  
% Histogram Equalization using histeq()  
I_histeq = histeq(I);  
  
% Display Results  
figure;  
  
subplot(2,3,1);  
imshow(I);  
title('Original Grayscale Image');  
  
subplot(2,3,2);  
imshow(I_manual);  
title('Manual Histogram Equalization');
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subplot(2,3,3);
imshow(I_histeq);
title('histeq() Result');

subplot(2,3,4);
imhist(I);
title('Original Histogram');

subplot(2,3,5);
imhist(I_manual);
title('Manual Equalized Histogram .');

subplot(2,3,6);
imhist(I_histeq);
title('histeq Equalized Histogram');

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