Title: Identifying and Counting Flowers

Introduction:

Flower counting technique is used to get an approximation of the count of number of flowers using MATLAB coding. Since manual counting of any object is a tedious job, time consuming and costly, we have come up with a code that is computer based algorithm to count the number of flowers. The estimation is done by using certain image enhancement techniques such as Image enhancement, segmentation, morphological process, spatial domain filters and many among others. Counting of the flowers is done by enhancement techniques following by the segmentation of our region of interest and then counting the resultant segmented elements.

Motivation:

It is the need of the hour to develop an automatic counting algorithm to facilitate the task and do it quickly, with greater accuracy and precision. In the present study we developed an algorithm that could generate results for counting of flowers and which will be useful to yield information. A set of 40 sample images have been used to run the code. The sample images used in the project are taken in various lighting environment such as a bright image, dark image, gray scale image, sharp image.

We will try to get the accuracy of the algorithm used and would compare it with the existing system.

Existing System:

Though there are many research papers and pre-existing online applications, these algorithms are mainly dependent on the precession and accuracy of it. The complexity of the algorithm and its need is dependent on the problem statement which can be popularly solved by various programming languages such as R programming, Python, Matlab, etc,.

Challenges in the existing system:

Though there are several researches pertaining to a given problem, there are several ways to solve the problem the major challenge that has been is the variety of conditions for the photo to be taken such as climate or environment or other physical aspects of the flower or the angle in which the image has been taken.

Highlights:

The main purpose of this algorithm is to Count the number of flowers which is done by enhancement techniques following by the segmentation of our region of interest and then counting the resultant segmented elements. We are using a variety of sample set in various environment backgrounds, different size, shape, climate and colour, Due to different angles of photo capturing some of the region of interest might get blurred out, for which we have to implement a variety of image processing techniques to get a better approximation.

Explanation:

In this new system we first used image enhancement technics like image acquisition and then converted the coloured image into grey level image along with histograms of the same image and then spatial domain enhancement techniques have been applied such as brightness adjusting operations(increase and decrease the brightness), histogram equalization, point processing technique, power law transform, image negative, thresholding, converting grey level image into binary, PSNR technique, Entropy, Edge detection and extracting the features and finally using feature analysis to count objects. Also we have done few sample experiments on the various types of datasets collected.

Coding:

```
%%load a image
I = imread("a1.jpg.jpg");
%%convert rgb image into grey level image
img =rgb2gray(I);
%%display image
figure(1);
subplot(2,2,1);imshow(I);title('original color image');
%%display histogram of the image
subplot(2,2,2);imhist(I);title('Histogram of color image');
subplot(2,2,3);imshow(img);title('grey level image');
subplot(2,2,4);imhist(img);title('Histogram of grey level image');
%%spitial domain enhancement - brightness adjust operations
R = imadjust(img);
figure(2);
subplot(2,2,1);imshow(img);
title('grey level image ');
subplot(2,2,2);imhist(img);
title('histogram of grey level image');
subplot(2,2,3);imshow(R);
title('grey image after brightness adjusted');
subplot(2,2,4);imhist(R);
title('histogram after brightness adjusted');
R = img+60;
figure(3);
subplot(2,2,1);imshow(img);
title('grey level image ');
subplot(2,2,2);imhist(img);
title('histogram of grey level image');
subplot(2,2,3);imshow(R);
title('grey image after brightness adjusted');
subplot(2,2,4);imhist(R);
title('histogram after brightness adjusted');
R = img-60;
figure(4);
subplot(2,2,1);imshow(img);
title('grey level image ');
subplot(2,2,2);imhist(img);
```

```
title('histogram of grey level image');
subplot(2,2,3);imshow(R);
title('grey image after brightness adjusted');
subplot(2,2,4);imhist(R);
title('histogram after brightness adjusted');
%%image negative
figure(5);
t = 255-img;
subplot(1,2,1),imshow(img),title('grey image');
subplot(1,2,2),imshow(t),title('image negative');
%%Histogram euqlization
figure(6);
P = histeq(img);
subplot(2,2,1),imshow(img),title('grey image');
subplot(2,2,2),imshow(P),title('After histogram equlization');
subplot(2,2,3),imhist(img),title('grey image histogram');
subplot(2,2,4),imhist(P),title('After histogram equalization');
%%point processing technique
figure(7);
gamma = 1.1;
d = double(img).^gamma;
subplot(2,2,1),imshow(img),title('grey image');
subplot(2,2,2),imshow(uint8(d)),title('powerlaw transformation');
subplot(2,2,3),imhist(img),title('grey image histogram');
subplot(2,2,4),imhist(uint8(d)),title('After powerlaw transform');
%%threshold
figure(8);
img =img(:,:,1);
[x,y]=size(img);
e1=input('enter upper threshold parameter');
for i=1:x
   for j=1:y
      if img(i,j)<e1
         b(i,j)=0;
      else
         b(i,j)=255;
      end
   end
end
for i=1:x
```

```
    for j=1:y
        c(i,j)=img(i,j) & b(i,j);
    end
end
subplot(2,2,1),imshow(img),title('grey image');
subplot(2,2,2),imshow(b),title('threshold image');
subplot(2,2,3),imshow(c),title('superimposed image');

%%converting grey level image into binary image
figure(9);
level =0.5;
Ithresh = im2bw(img,level);
imshowpair(I,Ithresh,'montage');

%%Entropy
E = entropy(img);
E

%%PSNR
B = double(I);
U = double(img);

[x,y] = size(B);
error = B-U;
MSE=sum(sum(error.*error))/(x*y);
if(MSE>0)
    PSNR = 10*log(255*255/MSE)/log(10)
else
    PSNR=99
end
error
MSE
PSNR
%%%%%%%%%%%%%%%%%%%%%%%%

I = imread("purple flowers.jpeg");
%% RGB color space
rmat=I(:,:,1);
gmat=I(:,:,2);
bmat=I(:,:,3);
```

```
figure(1);
subplot(2,2,1);imshow(rmat);title('Red plane');
subplot(2,2,2);imshow(gmat);title('green plane');
subplot(2,2,3);imshow(bmat);title('blue plane');
subplot(2,2,4);imshow(I);title('original image');

%%
figure(2);
levelr =0.63;
levelg =0.5;
levelb =0.4;
i1 = im2bw(rmat,levelr);
i2 = im2bw(gmat,levelg);
i3 = im2bw(bmat,levelb);
Isum =(i1&i2&i3);
subplot(2,2,1);imshow(i1);title('Red plane');
subplot(2,2,2);imshow(i2);title('green plane');
subplot(2,2,3);imshow(i3);title('blue plane');
subplot(2,2,4);imshow(Isum);title('sum of all planes');
%%morphology
%% fill holes and complement image
Icomp = imcomplement(Isum);
Ifilled = imfill(Icomp,'holes');
figure(3);
imshow(Ifilled);

%%structuring element
se = strel('disk',100);
Iopenned = imopen(Ifilled,se);
figure(4);
imshow(Iopenned);

%%extract features
Iregion =regionprops(Iopenned, 'centroid');
[labeled,num] =bwlabel(Iopenned,4);
stats =
regionprops(labeled,'Eccentricity','Area','BoundingBox','centroid','Filledarea','Fi
lledImage','Image','PixelIdxList','SubarrayIdx');
areas = [stats.Area];
eccentricities = [stats.Eccentricity];
```

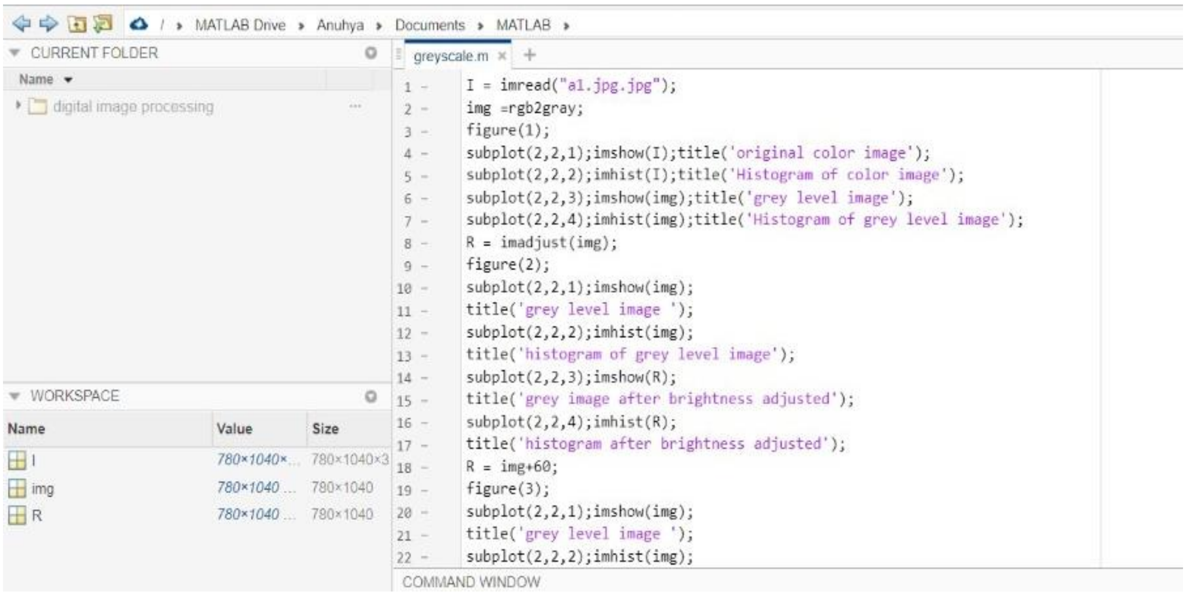
```
%%use feature analysis to count skittles objects
idxofskittles =find(eccentricities);
statsDefects = stats(idxofskittles);
figure(5);
subplot(1,2,1);imshow(Iopenned);title('segmented image');
subplot(1,2,2);imshow(I);title('Original image');
hold on;
for idx = 1 : length(idxofskittles)
   h = rectangle('position',statsDefects(idx).BoundingBox)
   set(h,'EdgeColor',[.75 0 0]);
   hold on;
end
if idx>1
   title(['There are',num2str(num),'flowers in the image'])
end
hold off;


%%structuring element
se = strel('disk',300);
Iopenned = imopen(Ifilled,se);
figure(6);
imshow(Iopenned);

%%extract features
Iregion =regionprops(Iopenned, 'centroid');
[labeled,num] =bwlabel(Iopenned,4);
stats =
regionprops(labeled,'Eccentricity','Area','BoundingBox','centroid','Filledarea','Fi
lledImage','Image','PixelIdxList','SubarrayIdx');
areas = [stats.Area];
eccentricities = [stats.Eccentricity];

%%use feature analysis to count skittles objects
idxofskittles =find(eccentricities);
statsDefects = stats(idxofskittles);
figure(7);
subplot(1,2,1);imshow(Iopenned);title('segmented image');
subplot(1,2,2);imshow(I);title('Original image');
```

```
hold on;
for idx = 1 : length(idxofskittles)
   h = rectangle('position',statsDefects(idx).BoundingBox)
   set(h,'EdgeColor',[.75 0 0]);
   hold on;
end
if idx>1
   title(['There are',num2str(num),'flowers in the image'])
end
```

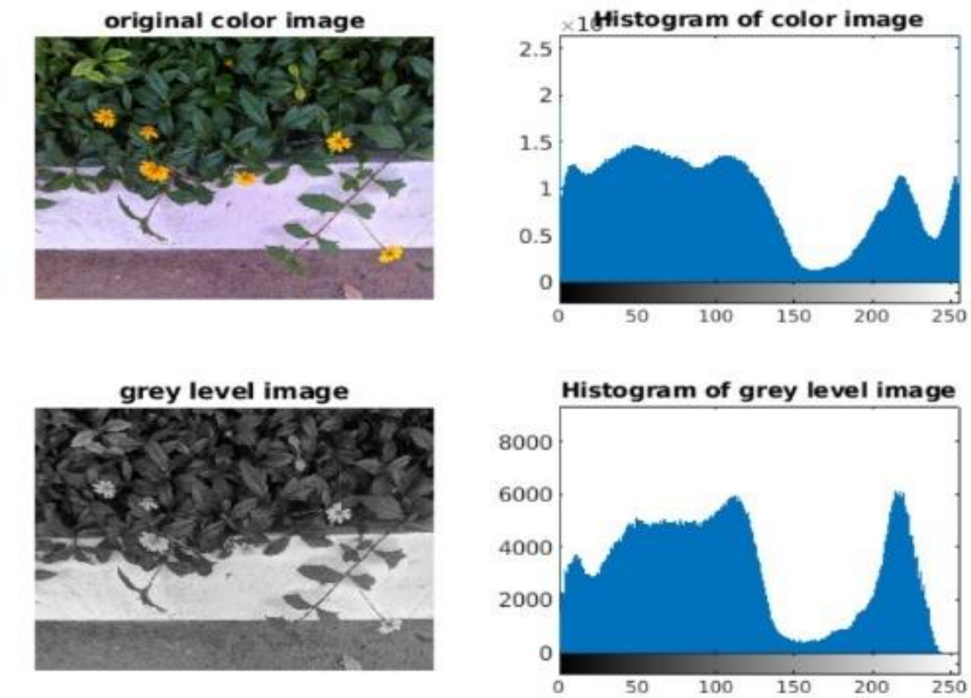
Experimental results and Discussion:

A detailed result section of every image processing technique is snipped below. The results contain the coded part and the obtained results from it.

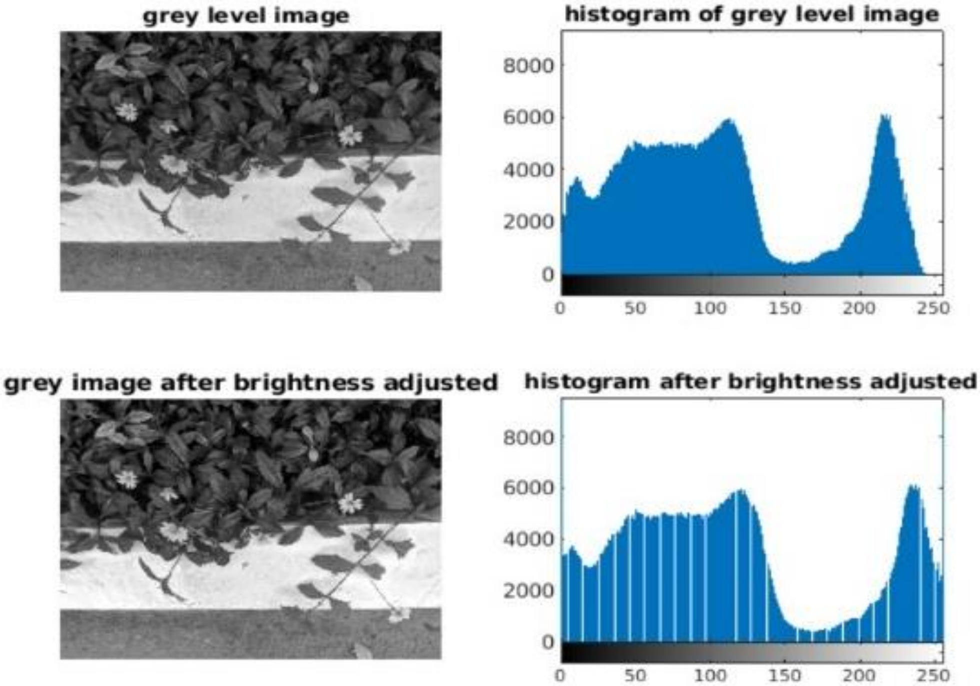
- Sample experiments on various flowers
- Spatial Enhancement:

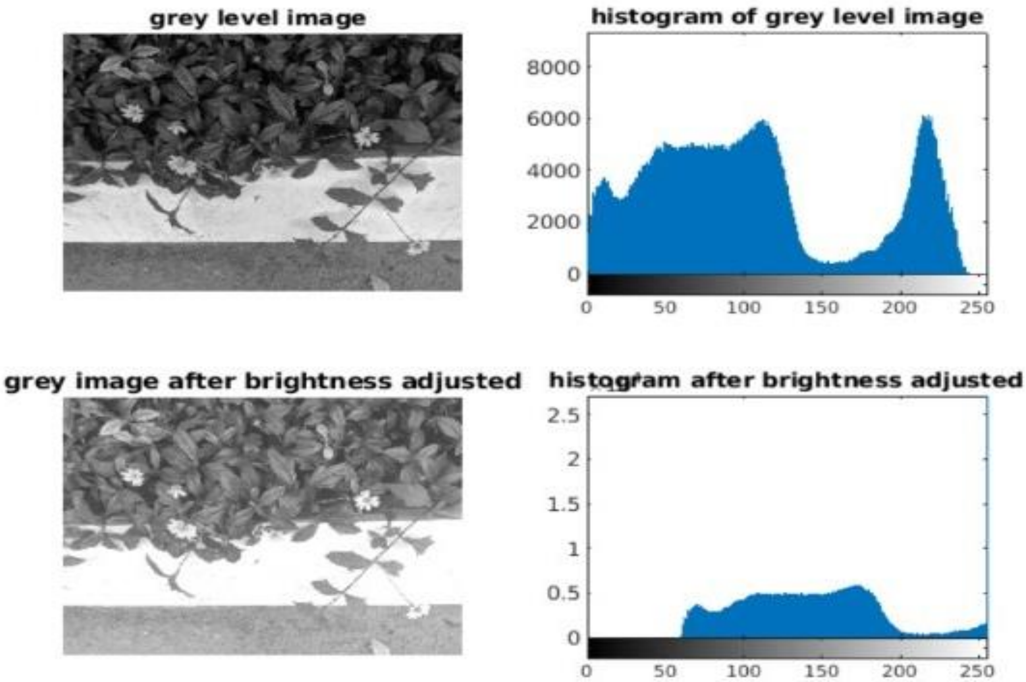



```
I = imread("a1.jpg.jpg");
img =rgb2gray;
figure(1);
subplot(2,2,1);imshow(I);title('original color image');
subplot(2,2,2);imhist(I);title('Histogram of color image');
subplot(2,2,3);imshow(img);title('grey level image');
subplot(2,2,4);imhist(img);title('Histogram of grey level image');
R = imadjust(img);
figure(2);
subplot(2,2,1);imshow(img);
title('grey level image ');
subplot(2,2,2);imhist(img);
title('histogram of grey level image');
subplot(2,2,3);imshow(R);
title('grey image after brightness adjusted');
subplot(2,2,4);imhist(R);
title('histogram after brightness adjusted');
R = img+60;
figure(3);
subplot(2,2,1);imshow(img);
title('grey level image ');
subplot(2,2,2);imhist(img);
```

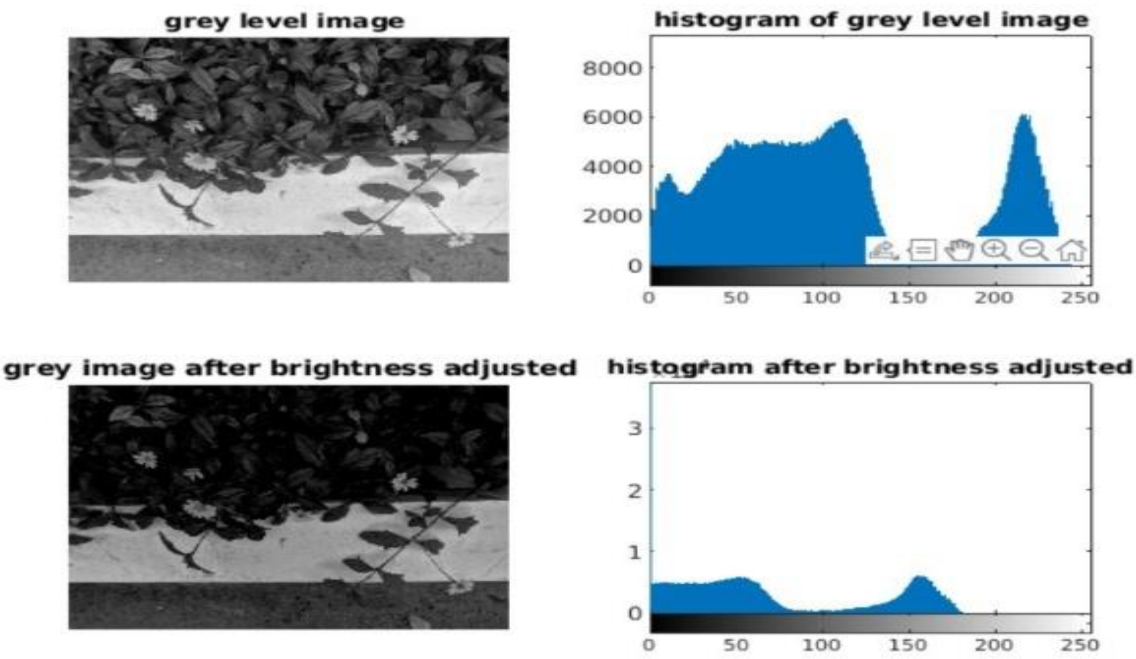


Histogram of original image to grey level image





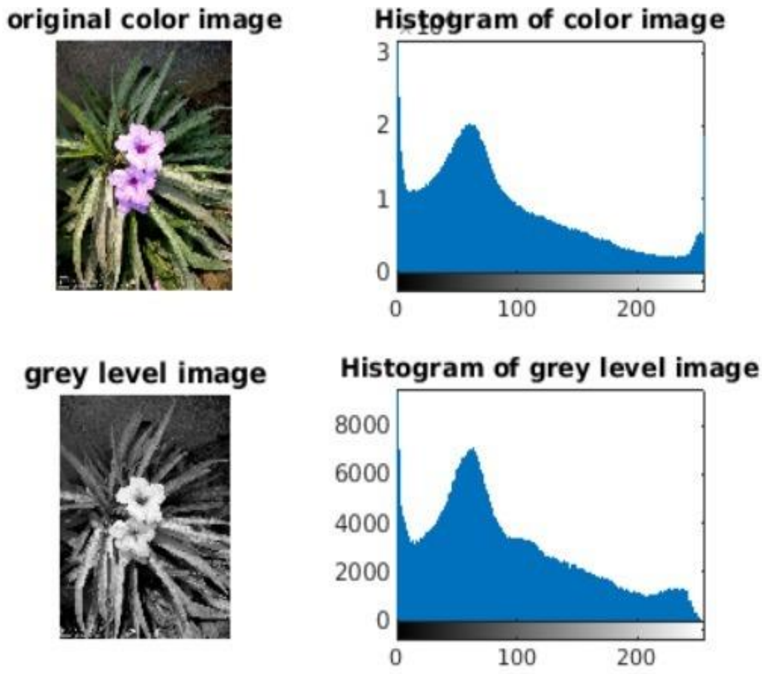
Histogram of grey level image to brightness adjusted images

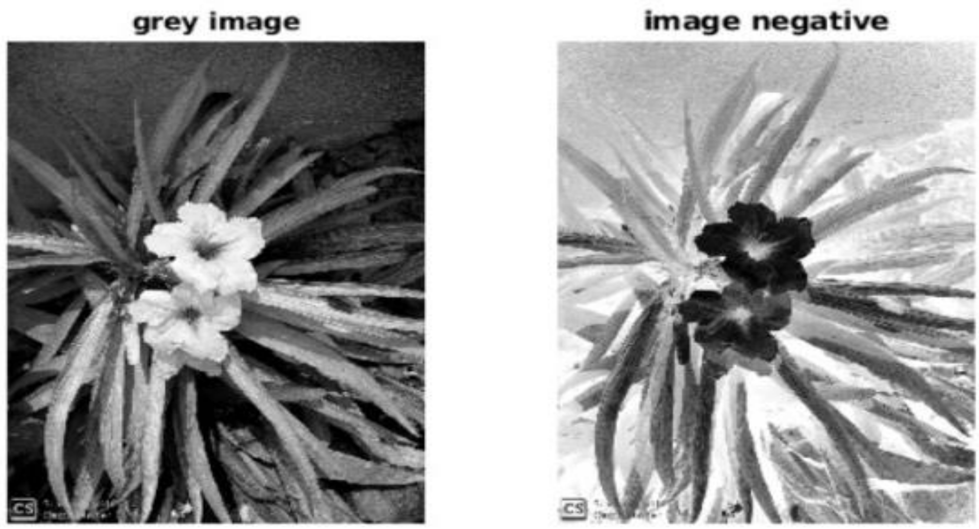


- Histogram of grey scale image to image negative:

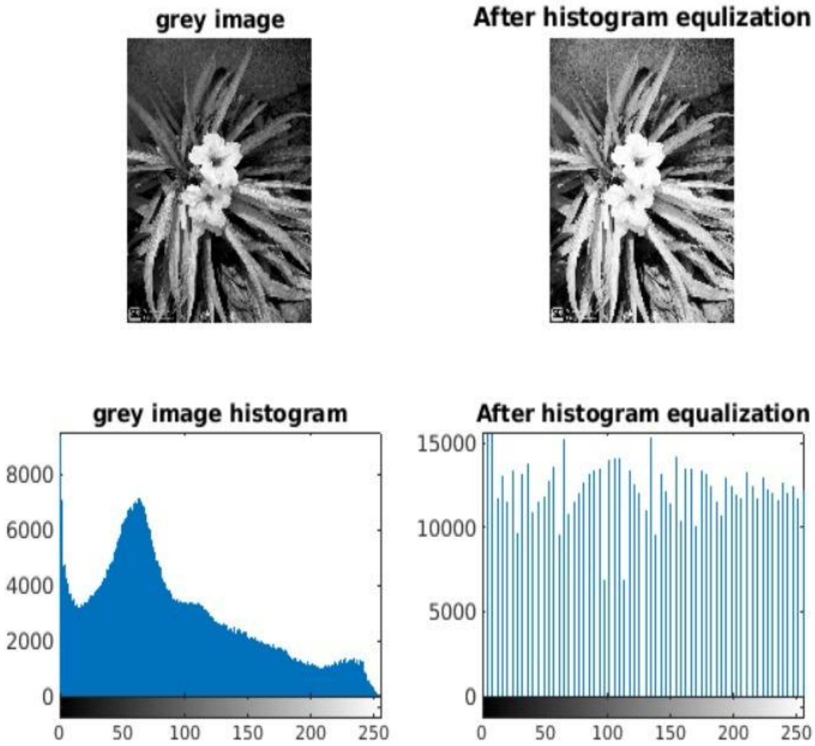
greyscale.m × | Figure 2 × | Figure 3 × | Figure 1 × | +

```
I = imread("purple flowers.jpeg");
img =rgb2gray(I);
figure(1);
subplot(2,2,1);imshow(I);title('original color image');
subplot(2,2,2);imhist(I);title('Histogram of color image');
subplot(2,2,3);imshow(img);title('grey level image');
subplot(2,2,4);imhist(img);title('Histogram of grey level image');
R = imadjust(img);
%%image negative
figure(2);
t = 255-img;
subplot(1,2,1),imshow(img),title('grey image');
subplot(1,2,2),imshow(t),title('image negative');
%%Histogram euqlization
figure(3);
P = histeq(img);
subplot(2,2,1),imshow(img),title('grey image');
subplot(2,2,2),imshow(P),title('After histogram equlization');
subplot(2,2,3),imhist(img),title('grey image histogram');
subplot(2,2,4),imhist(P),title('After histogram equalization');
```

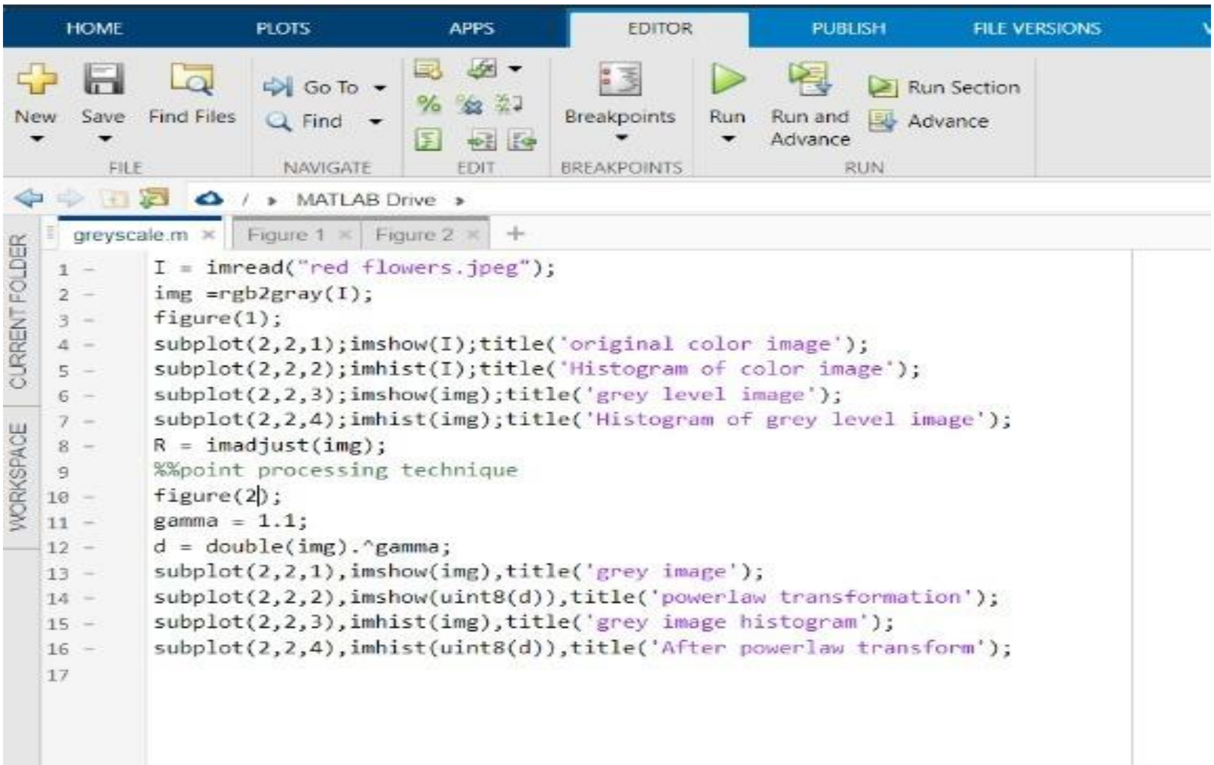

original color image
Histogram of color image
3
2
1
0
0
100
200
grey level image
Histogram of grey level image
8000
6000
4000
2000
0
0
100
200

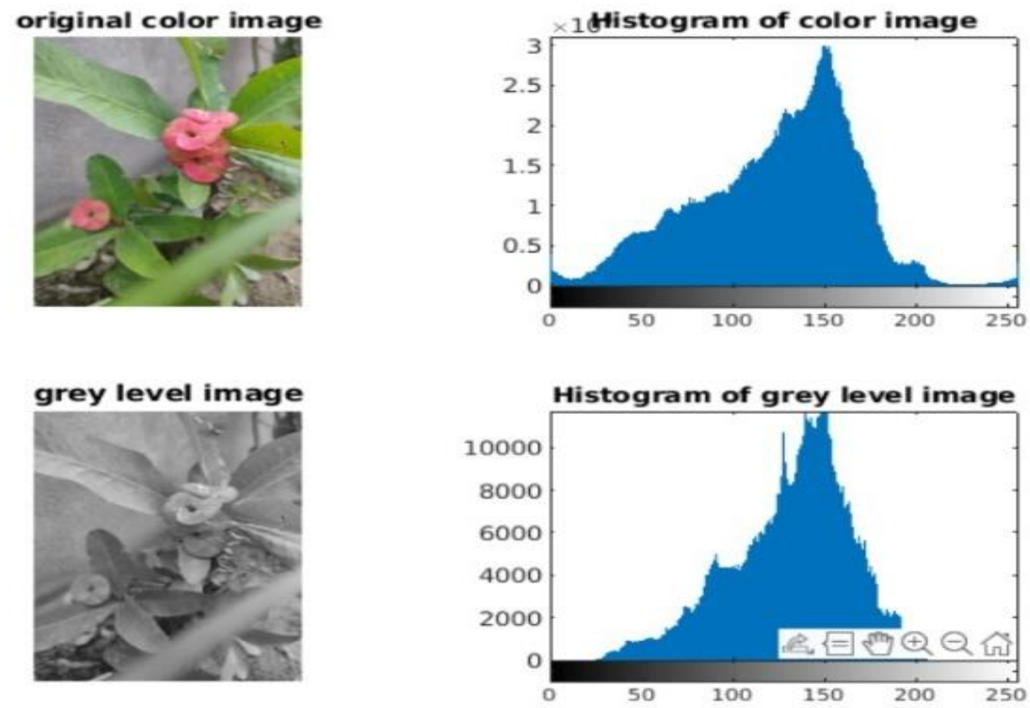

grey image
image negative

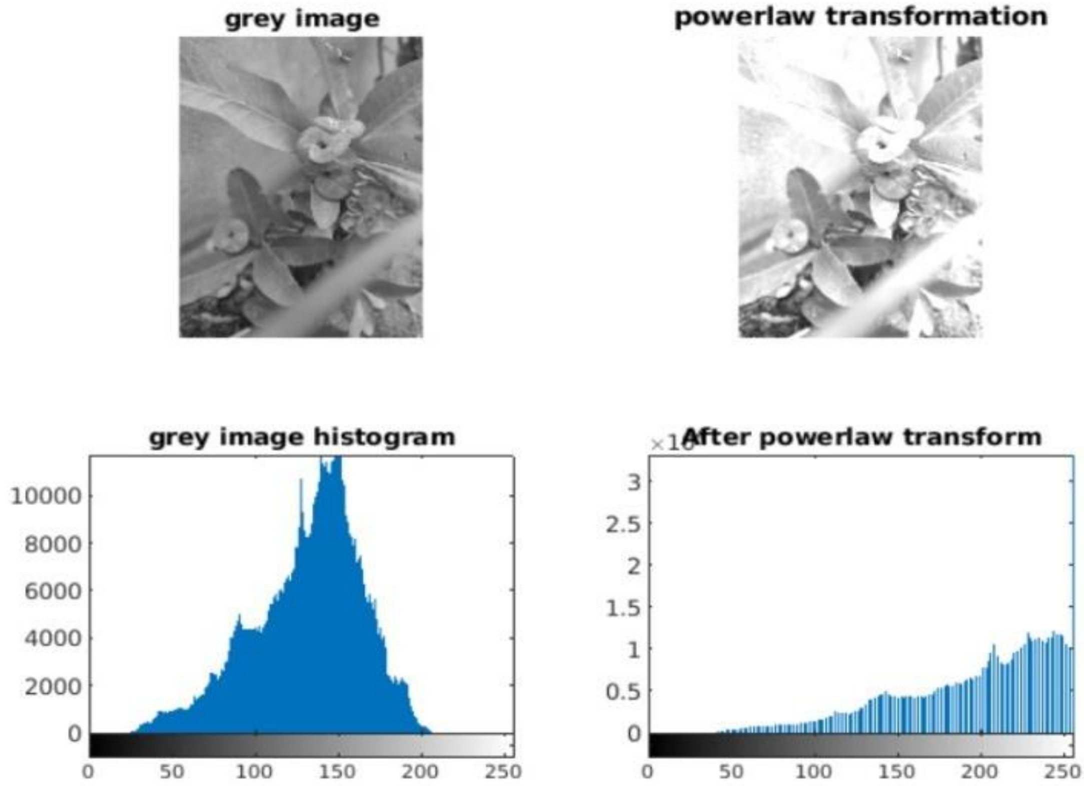
- Histogram equalisation:



- Point processing technique:

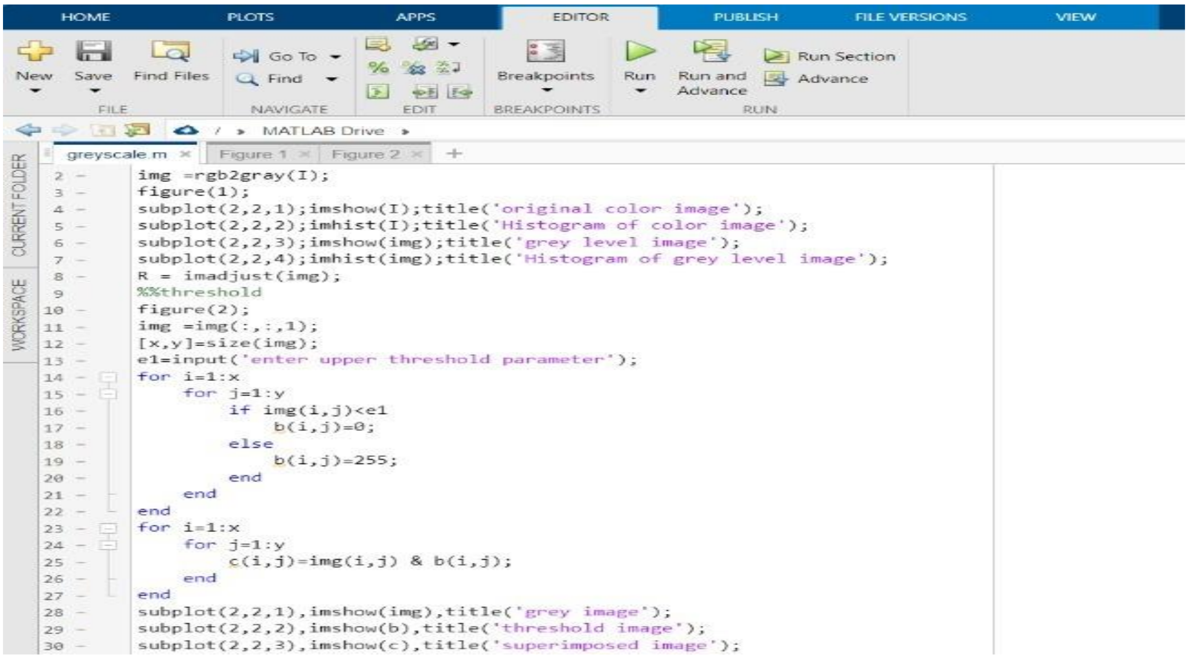


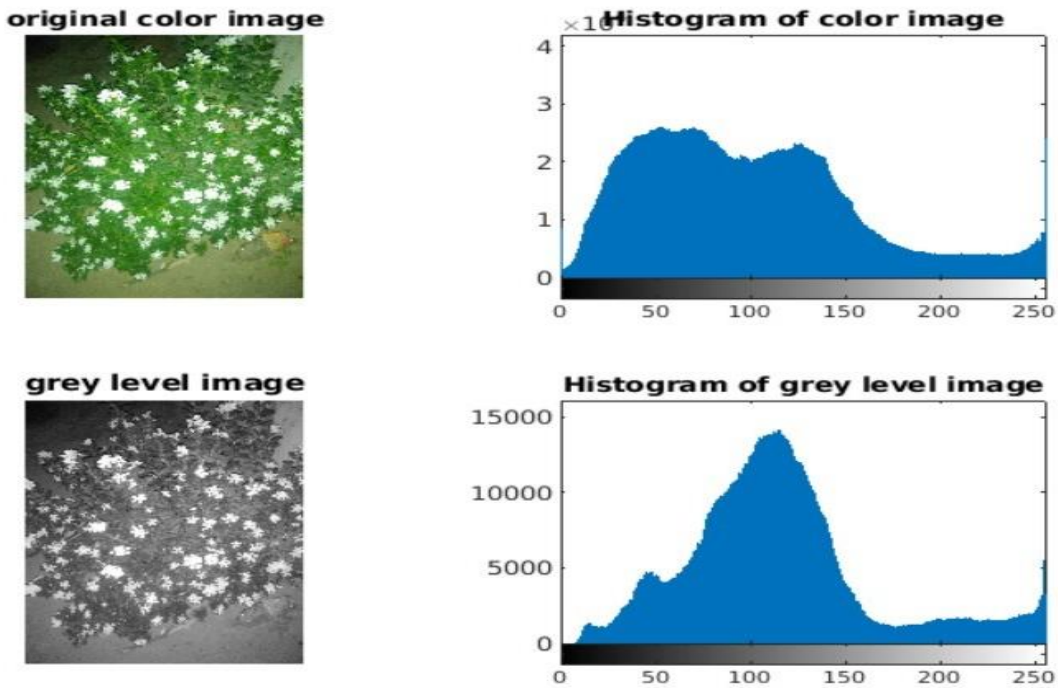




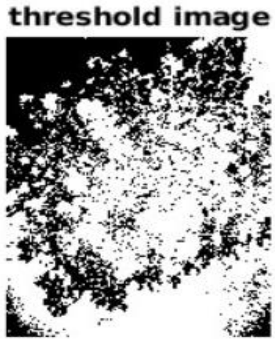
Point processing technique- Power law transformation

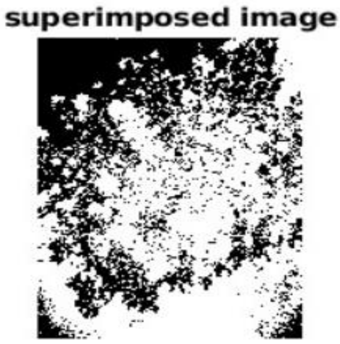
Thresholding:





Threshold in night light



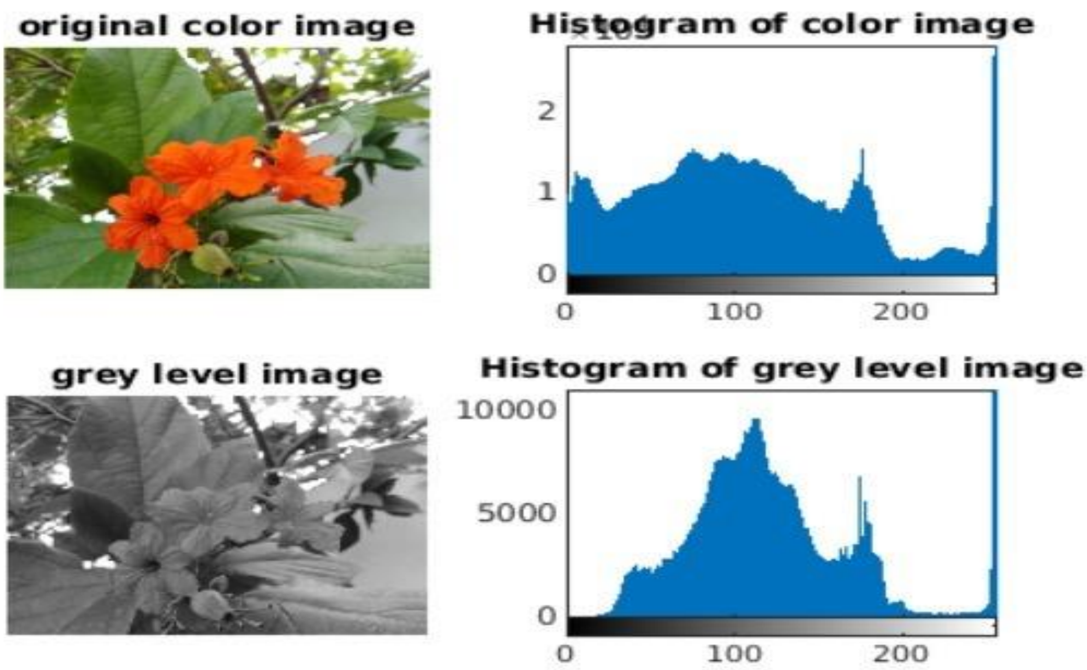


Threshold value upper parameter 101

- Gray image to binary image:

greyscale.m × Figure 1 × Figure 9 ×

```
I = imread("orange flowers.jpeg");
img =rgb2gray(I);
figure(1);
subplot(2,2,1);imshow(I);title('original color image');
subplot(2,2,2);imhist(I);title('Histogram of color image');
subplot(2,2,3);imshow(img);title('grey level image');
subplot(2,2,4);imhist(img);title('Histogram of grey level image');
R = imadjust(img);
%%converting grey level image into binary image
figure(9);
level =0.5;
Ithresh = im2bw(img,level);
imshowpair(I,Ithresh,'montage');

%%Entropy
E = entropy(img);
E

%%PSNR
B = double(I);
U = double(img);

[x,y] = size(B);
error = B-U;
MSE=sum(sum(error.*error))/(x*y);
if(MSE>0)
    PSNR = 10*log(255*255/MSE)/log(10);
else
    PSNR=99;
```



- Identifying and counting flowers

final.m × Figure 1 × Figure 2 × Figure 3 × Figure 6 × Figure 7 ×

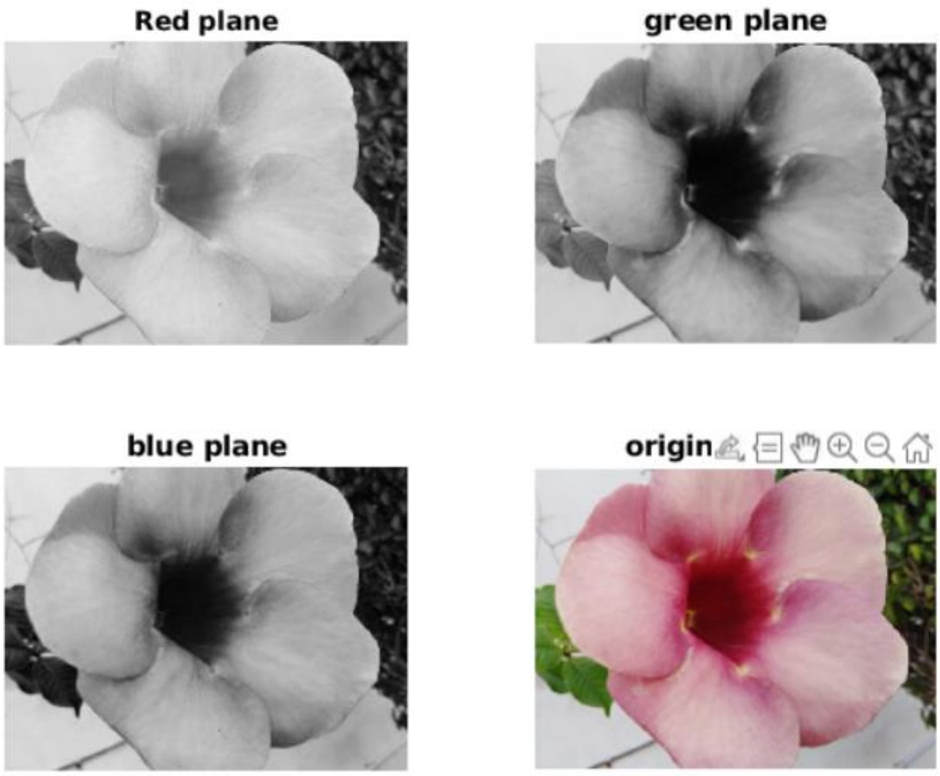
```
I = imread("hibiscus 1.jpeg");
%% RGB color space
rmat=I(:,:,1);
gmat=I(:,:,2);
bmat=I(:,:,3);
figure(1);
subplot(2,2,1);imshow(rmat);title('Red plane');
subplot(2,2,2);imshow(gmat);title('green plane');
subplot(2,2,3);imshow(bmat);title('blue plane');
subplot(2,2,4);imshow(I);title('original image');

%%
figure(2);
levelr =0.63;
levelg =0.5;
levelb =0.4;
i1 = im2bw(rmat,levelr);
i2 = im2bw(gmat,levelg);
i3 = im2bw(bmat,levelb);
Isum =(i1&i2&i3);
subplot(2,2,1);imshow(i1);title('Red plane');
subplot(2,2,2);imshow(i2);title('green plane');
subplot(2,2,3);imshow(i3);title('blue plane');
subplot(2,2,4);imshow(Isum);title('sum of all planes');
%%morphology
```

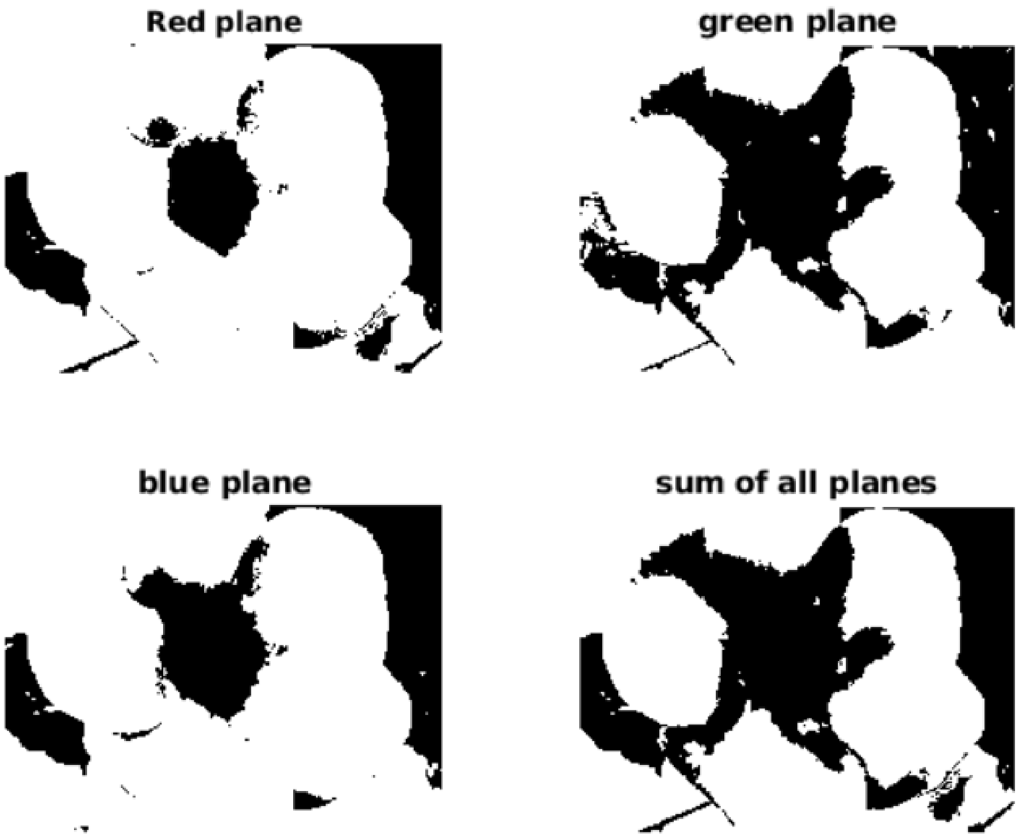
final.m × Figure 1 × Figure 2 × Figure 3 × Figure 6 × Figure 7 ×

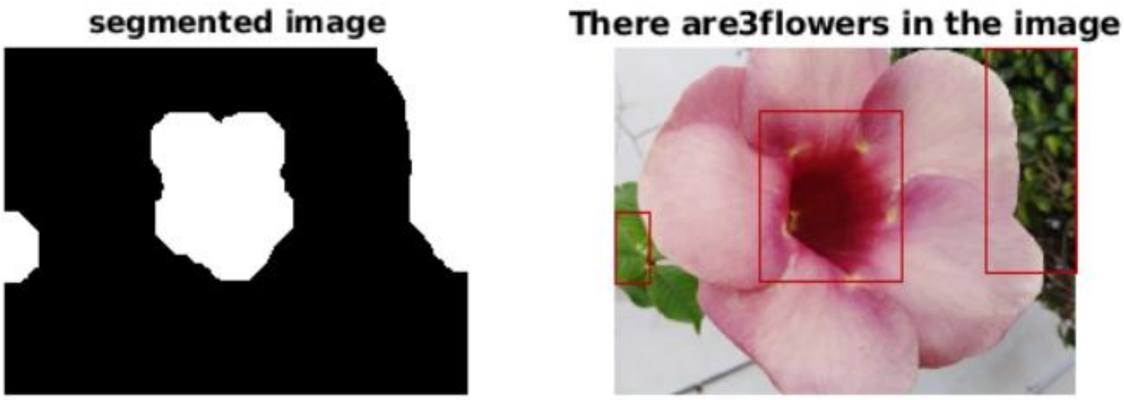
```
%% fill holes and complement image
Icomp = imcomplement(Isum);
Ifilled = imfill(Icomp,'holes');
figure(3);
imshow(Ifilled);

%%structuring element
se = strel('disk',100);
Iopenned = imopen(Ifilled,se);
figure(4);
imshow(Iopenned);

%%extract features
Iregion =regionprops(Iopenned, 'centroid');
[labeled,num] =bwlabel(Iopenned,4);
stats = regionprops(labeled,'Eccentricity','Area','BoundingBox','centroid','Filledarea','FilledImage','Image','PixelIdxList','SubarrayIdx');
areas = [stats.Area];
eccentricities = [stats.Eccentricity];

%%use feature analysis to count skittles objects
idxofskittles =find(eccentricities);
statsDefects = stats(idxofskittles);
figure(5);
subplot(1,2,1);imshow(Iopenned);title('segmented image');
subplot(1,2,2);imshow(I);title('Original image');
hold on;
```

```
for idx = 1 : length(idxofskittles)
    h = rectangle('position',statsDefects(idx).BoundingBox)
    set(h,'EdgeColor',[.75 0 0]);
    hold on;
end
if idx>1
    title(['There are',num2str(num),'objects in the image'])
end
hold off;


%%structuring element
se = strel('disk',50);
Iopenned = imopen(Ifilled,se);
figure(6);
imshow(Iopenned);

%%extract features
Iregion =regionprops(Iopenned, 'centroid');
[labeled,num] =bwlabel(Iopenned,4);
stats = regionprops(labeled,'Eccentricity','Area','BoundingBox','centroid','Filledarea','FilledImage','Image','PixelIdxList','SubarrayIdx');
areas = [stats.Area];
eccentricities = [stats.Eccentricity];
```

```

%%use feature analysis to count skittles objects
idxofskittles =find(eccentricities);
statsDefects = stats(idxofskittles);
figure(7);
subplot(1,2,1);imshow(Iopenned);title('segmented image');
subplot(1,2,2);imshow(I);title('Original image');
hold on;
for idx = 1 : length(idxofskittles)
    h = rectangle('position',statsDefects(idx).BoundingBox)
    set(h,'EdgeColor',[.75 0 0]);
    hold on;
end
if idx>1
    title(['There are',num2str(num),'books in the image'])
end
hold off;
```


Red plane
green plane
blue plane
origin


Red plane
green plane
blue plane
sum of all planes


segmented image
There are3flowers in the image

Conclusion:

When there are no objects other than flowers in the image then the count is correctly displayed but the image is successfully enhanced after segmentation using MATLAB.

In the first input due to the complexity of the image and irregular shape of the flower while clicking the picture the output wasn't accurate. However, we overcame the challenges of the above condition. Other than that, we achieved the desired output by extracting the region of interest of the input image using that particular MATLAB code as mentioned in the experiment and successfully identified the flower present in the image. But couldn't identify the count of the flowers since it is irregular

References:

1. https://in.mathworks.com/videos/image-processing-made-easy-81718.html
2. https://www.youtube.com/watch?v=gjloQKUrLLc&t=30s
3. https://in.mathworks.com/videos/image-segmentation-app-1504291389509.html