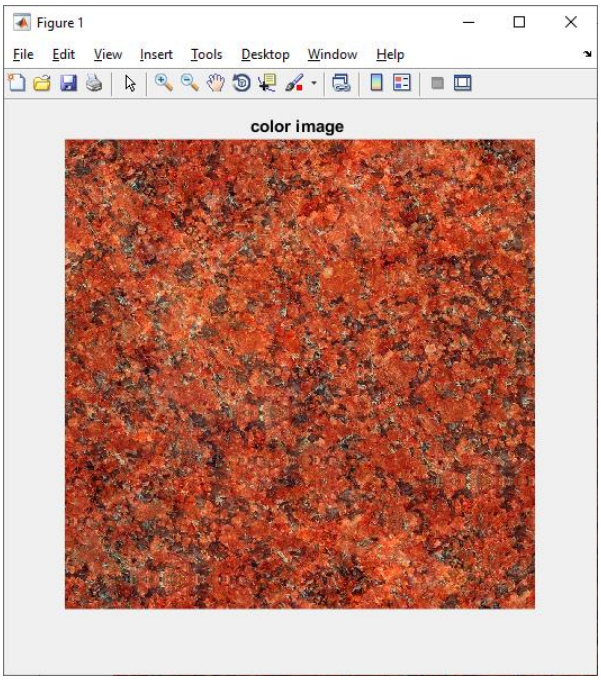
Computer Image Processing

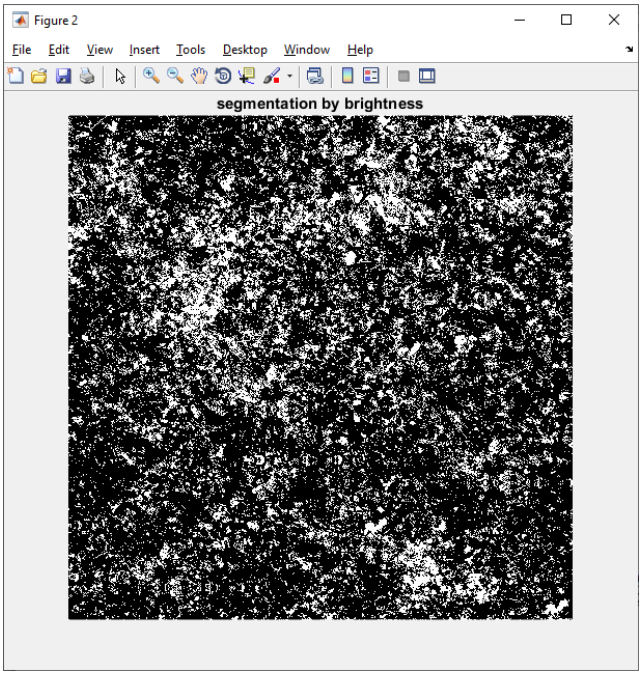
Classes 11 - Segmentation

Example 1

Segmentation by brightness

```
%SEGMENTATION BY BRIGHTNESS
Im.Name=('granit_red.jpg');%image reading
A1=imread(Im.Name);%A1 color image
A2=rgb2gray(A1);% A2 gray scale image
A3 = roicolor(A2,120,250); %A3 the result of segmentation by brightness
figure, imshow (A1); title ('color image ');% color image output A1
figure, imshow (A3); title ('segmentation by brightness');% output of
segmentation results A3
```

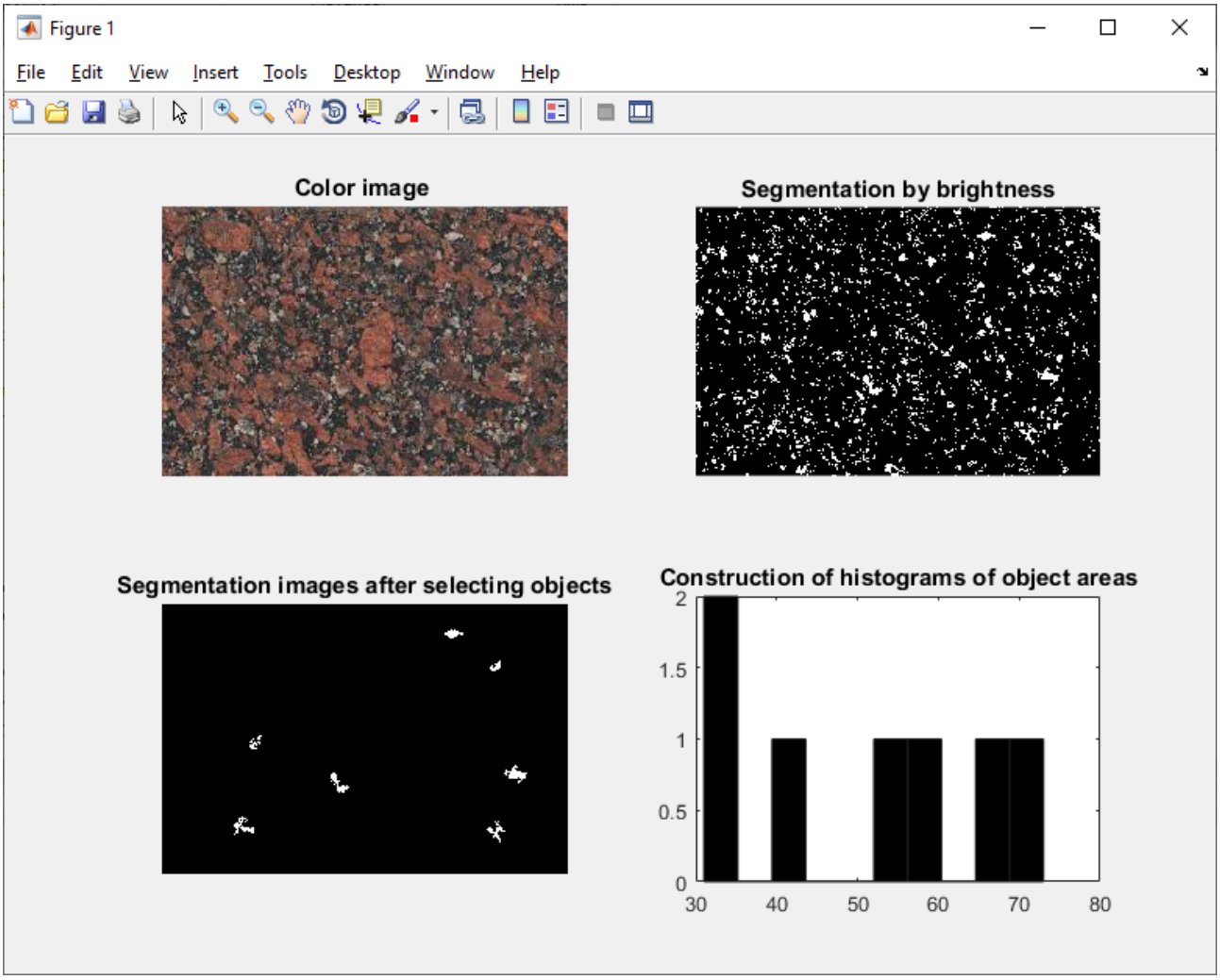




Exercise 1

*Write a program for segmentation by **brightness**. You need to select objects larger than 30 pixels in the image, and the center of mass of the objects is more than 20 pixels away from the image. Build histograms for these objects.*

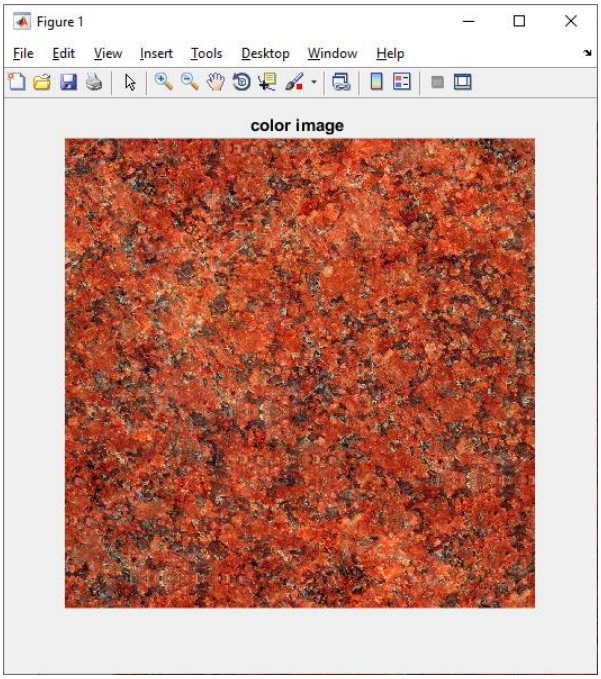
```
%SEGMENTATION BY BRIGHTNESS
Im.Name=('granit_red.jpg');%image reading
A1=imread(Im.Name);%A1 color image
A2=rgb2gray(A1);% A2 gray scale image
A3 = roicolor(A2,120,250); %A3 the result of segmentation by brightness
[L num]=bwlabel(A3, 8);% Search for objects
feats=regionprops(L, 'Area', 'Centroid');%Calculation of signs of calculations
% of objects: areas and coordinates of centers of mass
% Rewrite character values
% of the array of structures feats into individual arrays.
Areas=zeros(num);
CentX=zeros(num);
CentY=zeros(num);
for i=1:1:num
Areas(i)=feats(i).Area;
CentX(i)=feats(i).Centroid(1);
CentY(i)=feats(i).Centroid(2);
end;
% Forming a binary image from objects,
% whose area is more than 30 pixels and the center of mass of the objects is
removed
% of image boundaries by more than 20 pixels.
[rows cols]=size(A3);
idx=find(Areas>30&CentX>20&CentY>20&CentX<(cols-20)&CentY<(rows-20));
A4=ismember(L,idx);
% search for objects again
[L num]=bwlabel(A4, 8);
% Calculation of object areas.
feats=regionprops(L, 'Area');
subplot (2,2,1); imshow (A1); title ('Color image ');% color image output A1
subplot (2,2,2); imshow (A3); title ('Segmentation by brightness');% output of
segmentation results A3
subplot (2,2,3); imshow (A4); title ('Segmentation images after selecting
objects');%Segmentation images after selecting objects according to certain
parameters
subplot(2,2,4); hist([feats.Area]);title('Construction of histograms of object
areas');% Construction of histograms of object areas
```

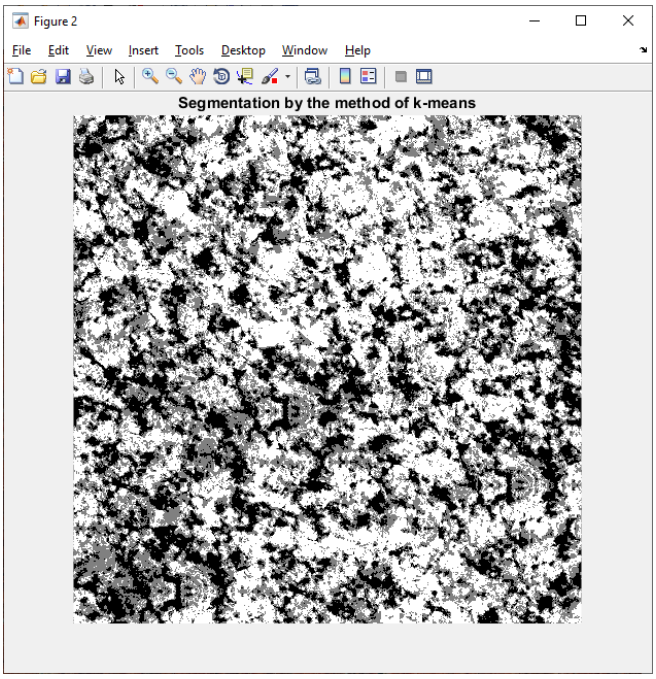


Example 2

Cluster segmentation

```
%CLUSTER SEGMENTATION
he=imread('granit_red.jpg');
I=rgb2gray(he);
cform=makecform('srgb2lab');
lab_he=applycform(he, cform);
ab=double(lab_he(:, :, 2:3));
nrows=size(ab, 1);
ncols=size(ab, 2);
ab=reshape(ab, nrows*ncols, 2);
nColors=3;
[cluster_idx cluster_center]=kmeans(ab, nColors, 'distance', 'sqEuclidean', ...
                                    'Replicates',3);
                                pixel_labels=reshape(cluster_idx,
nrows,ncols);
figure,imshow(he);title('Color image ')%color image output he
figure, imshow(pixel_labels,[]);title('Segmentation by the method of k-
means');%Segmentation by the method of k-means
```



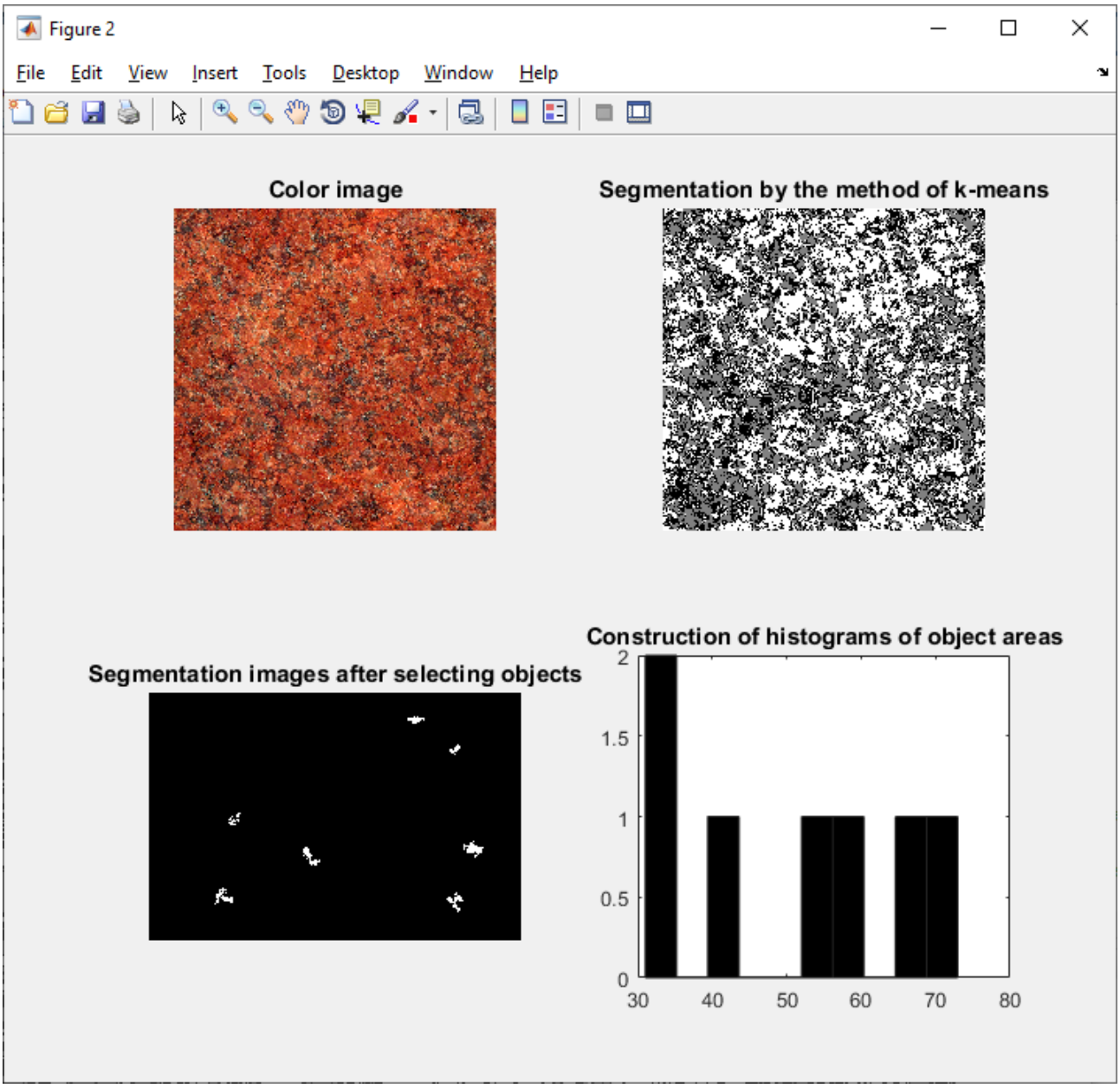


Exercise 2

*Write a program for segmentation by **cluster.** You need to select objects larger than 30 pixels in the image, and the center of mass of the objects is more than 20 pixels away from the image. Build histograms for these objects.*

```
%CLUSTER SEGMENTATION
he=imread('granit_red.jpg');
I=rgb2gray(he);
cform=makecform('srgb2lab');
lab_he=applycform(he, cform);
ab=double(lab_he(:, :, 2:3));
nrows=size(ab, 1);
ncols=size(ab, 2);
ab=reshape(ab, nrows*ncols, 2);
nColors=3;
[cluster_idx cluster_center]=kmeans(ab, nColors, 'distance', 'sqEuclidean', ...
                                    'Replicates',3);
                                  pixel_labels=reshape(cluster_idx,
nrows,ncols);
feats=regionprops(L, 'Area', 'Centroid');%Calculation of signs of calculations
% of objects: areas and coordinates of centers of mass
% Rewrite character values
% of the array of structures feats into individual arrays.
Areas=zeros(num);
CentX=zeros(num);
CentY=zeros(num);
for i=1:1:num
Areas(i)=feats(i).Area;
CentX(i)=feats(i).Centroid(1);
CentY(i)=feats(i).Centroid(2);
end;
% Forming a binary image from objects,
% whose area is more than 30 pixels and the center of mass of the objects is
removed
% of image boundaries by more than 20 pixels.
[rows cols]=size(pixel_labels);
idx=find(Areas>30&CentX>20&CentY>20&CentX<(cols-20)&CentY<(rows-20));
A4=ismember(L,idx);
```

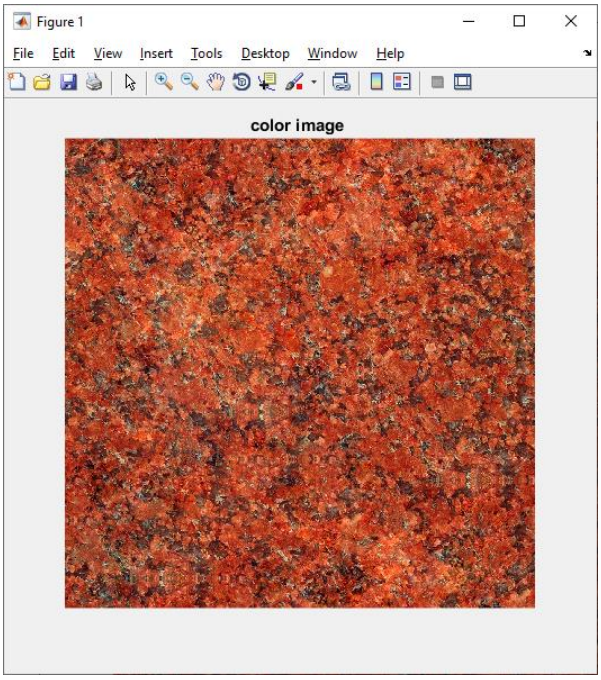
```
% search for objects again
[L num]=bwlabel(A4);
% Calculation of object areas
feats=regionprops(L, 'Area');
figure,subplot(2,2,1);imshow(he);title('Color image')%color image output A1  he
subplot(2,2,2); imshow(pixel_labels,[]);title('Segmentation by the method of k-
means');%Segmentation by the method of k-means pixel_labels
subplot(2,2,3);imshow(A4);title('Segmentation images after selecting
objects');%Segmentation images after selecting objects
subplot(2,2,4); hist([feats.Area]);title('Construction of histograms of object
areas');%Construction of histograms of object areas
```

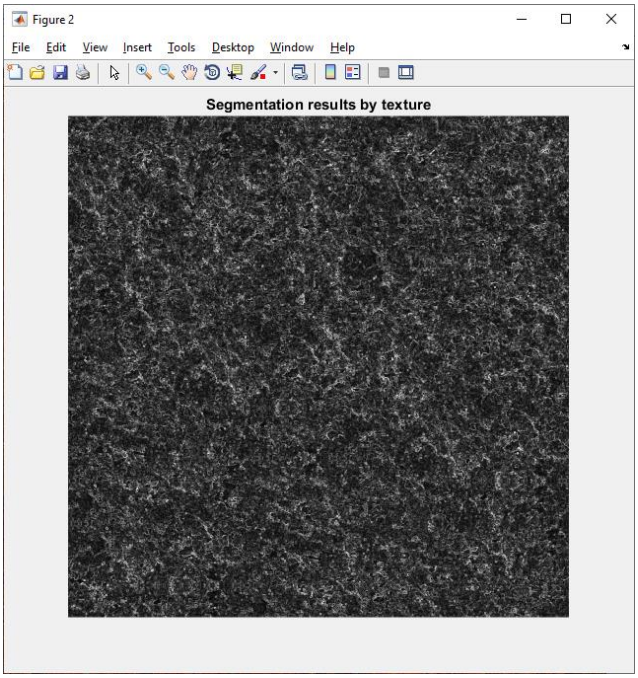


Example 3

Textural segmentation

```
%TEXTURAL SEGMENTATION
rgb=imread('granit_red.jpg');
 I=rgb2gray(rgb);
Eim = mat2gray(I); %texture selection
BW1 = im2bw(Eim, .1);%creating a rough mask
R = rangefilt(Eim,ones(3));
figure,imshow(rgb);title('Color image ')%color image output rgb
figure, imshow(R);title('Segmentation results by texture');%output of
segmentation results by texture
```





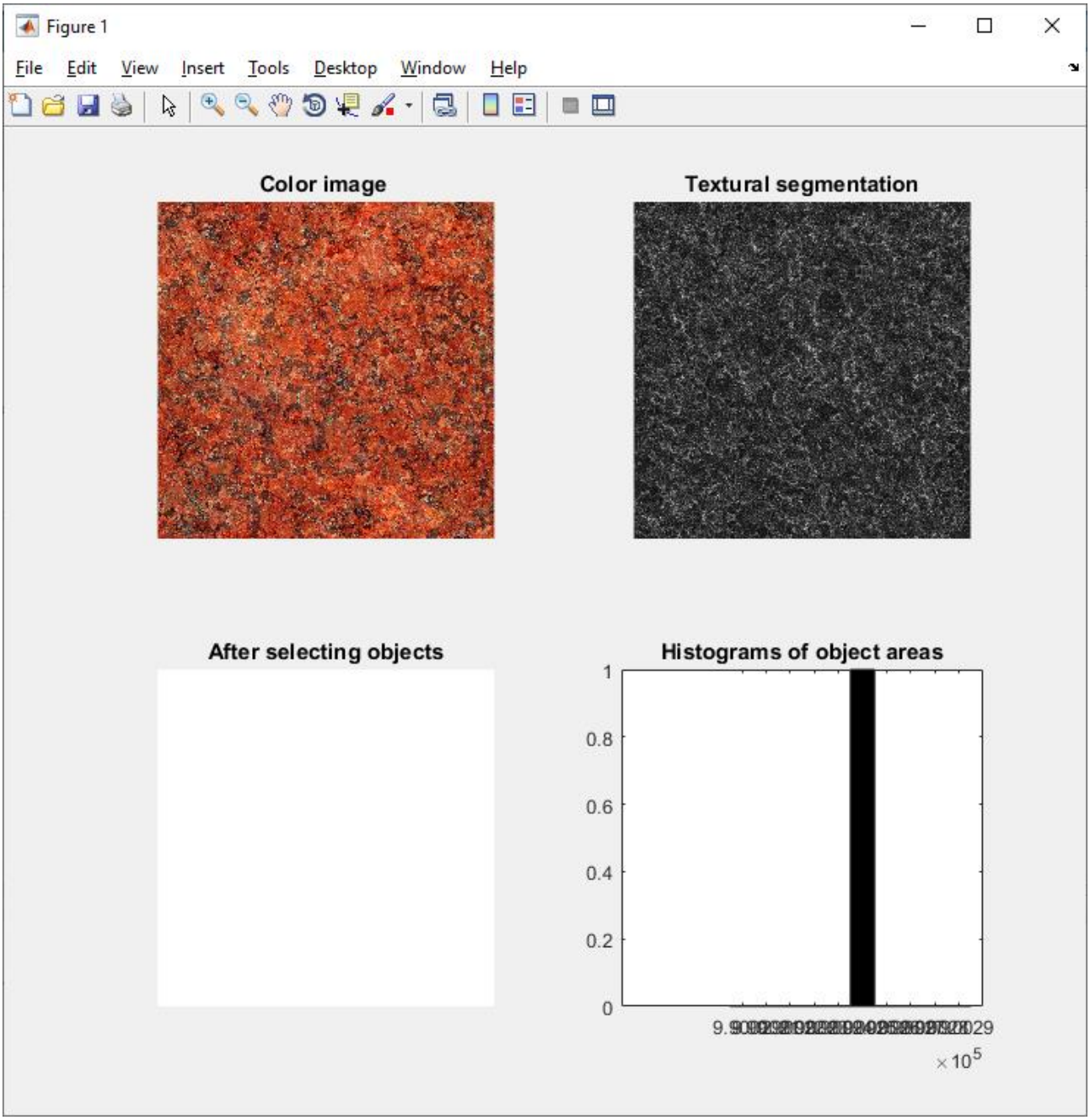
Exercise 3

*Write a program for segmentation by **textural**. You need to select objects larger than 30 pixels in the image, and the center of mass of the objects is more than 20 pixels away from the image. Build histograms for these objects.*

```
%TEXTURAL SEGMENTATION
rgb=imread('granit_red.jpg');
  I=rgb2gray(rgb);
Eim = mat2gray(I); %texture selection
BW1 = im2bw(Eim, .1);%creating a rough mask
R = rangefilt(Eim,ones(3));
  [L num]=bwlabel(R, 8);% search for objects
feats=regionprops(L, 'Area', 'Centroid');%Calculation of signs of calculations
% of objects: areas and coordinates of centers of mass
% Rewrite character values
% of the array of structures feats into individual arrays.
Areas=zeros(num);
CentX=zeros(num);
CentY=zeros(num);
for i=1:1:num
Areas(i)=feats(i).Area;
CentX(i)=feats(i).Centroid(1);
CentY(i)=feats(i).Centroid(2);
end;
% Forming a binary image from objects,
% whose area is more than 30 pixels and the center of mass of the objects is
removed
% of image boundaries by more than 20 pixels.
[rows cols]=size(R);
idx=find(Areas>30&CentX>20&CentY>20&CentX<(cols-20)&CentY<(rows-20));
A4=ismember(L,idx);

% search for objects again
[L num]=bwlabel(A4, 8);

%  Calculation of object areas
feats=regionprops(L, 'Area');
subplot(2,2,1);imshow(rgb);title('Color image ')% color image output rgb
subplot(2,2,2); imshow(R);title('Textural segmentation');%output of segmentation
results by texture Eim
subplot(2,2,3);imshow(A4);title('After selecting objects');%Segmentation images
after selecting objects
subplot(2,2,4); hist([feats.Area]);title('Histograms of object areas');%
Construction of histograms of object areas
```



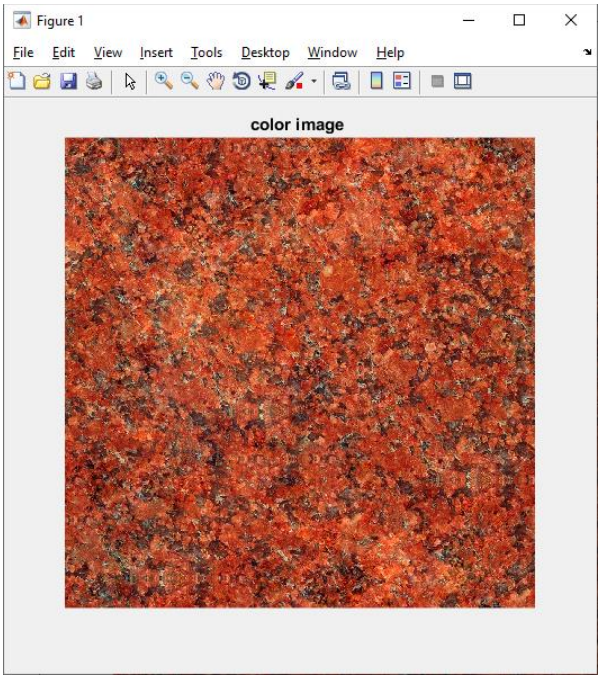
Example 4

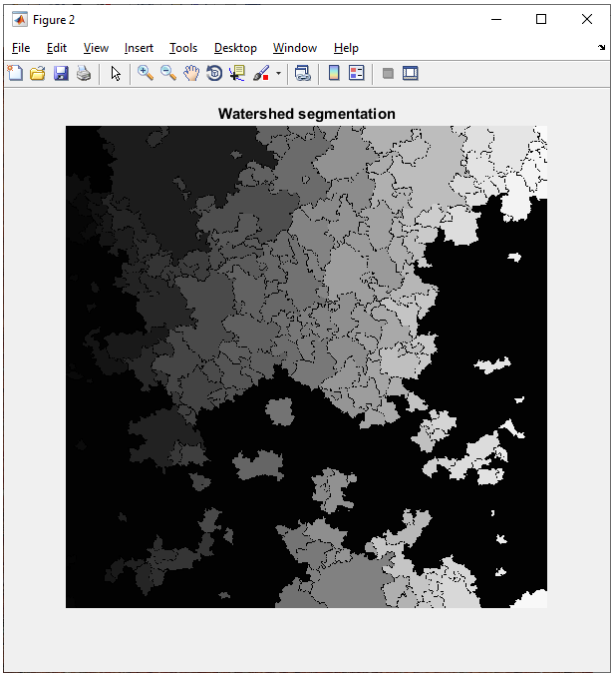
Watershed segmentation.

.

```
%watershed segmentation
rgb=imread('granit_red.jpg');
  I=rgb2gray(rgb);
 hy=fspecial('sobel');
hx=hy';
Iy=imfilter(double(I), hy, 'replicate');
Ix=imfilter(double(I), hx, 'replicate');
gradmag=sqrt(Ix.^2+Iy.^2);
L=watershed(gradmag);
Lrgb=label2rgb(L);
se=strel('disk', 1);
```

```
Io=imopen(I, se);
Ie=imerode(I, se);
Iobr=imreconstruct(Ie, I);
Ioc=imclose(Io, se);
Iobrd=imdilate(Iobr, se);
Iobrcbr=imreconstruct(imcomplement(Iobrd), imcomplement(Iobr));
Iobrcbr=imcomplement(Iobrcbr);
fgm=imregionalmax(Iobrcbr);
 I2=I;
 I2(fgm)=255;
  se2=strel(ones(5, 5));
 fgm2=imclose(fgm, se2);
 fgm3=imerode(fgm2, se2);
  fgm4=bwareaopen(fgm3, 20);
 I3=I;
 I3(fgm4)=255;
 bw=im2bw(Iobrcbr, graythresh(Iobrcbr));
    D=bwdist(bw);
  DL=watershed(D);
  bgm=DL==0;
  gradmag2=imimposemin(gradmag, bgm | fgm4);
   A3=watershed(gradmag2);
figure,imshow(rgb);title('Color image ')%color image output  rgb
    figure, imshow(A3), title('Watershed segmentation')
```





Exercise 4

*Write a program for segmentation by **watershed**. You need to select objects larger than 30 pixels in the image, and the center of mass of the objects is more than 20 pixels away from the image. Build histograms for these objects.*

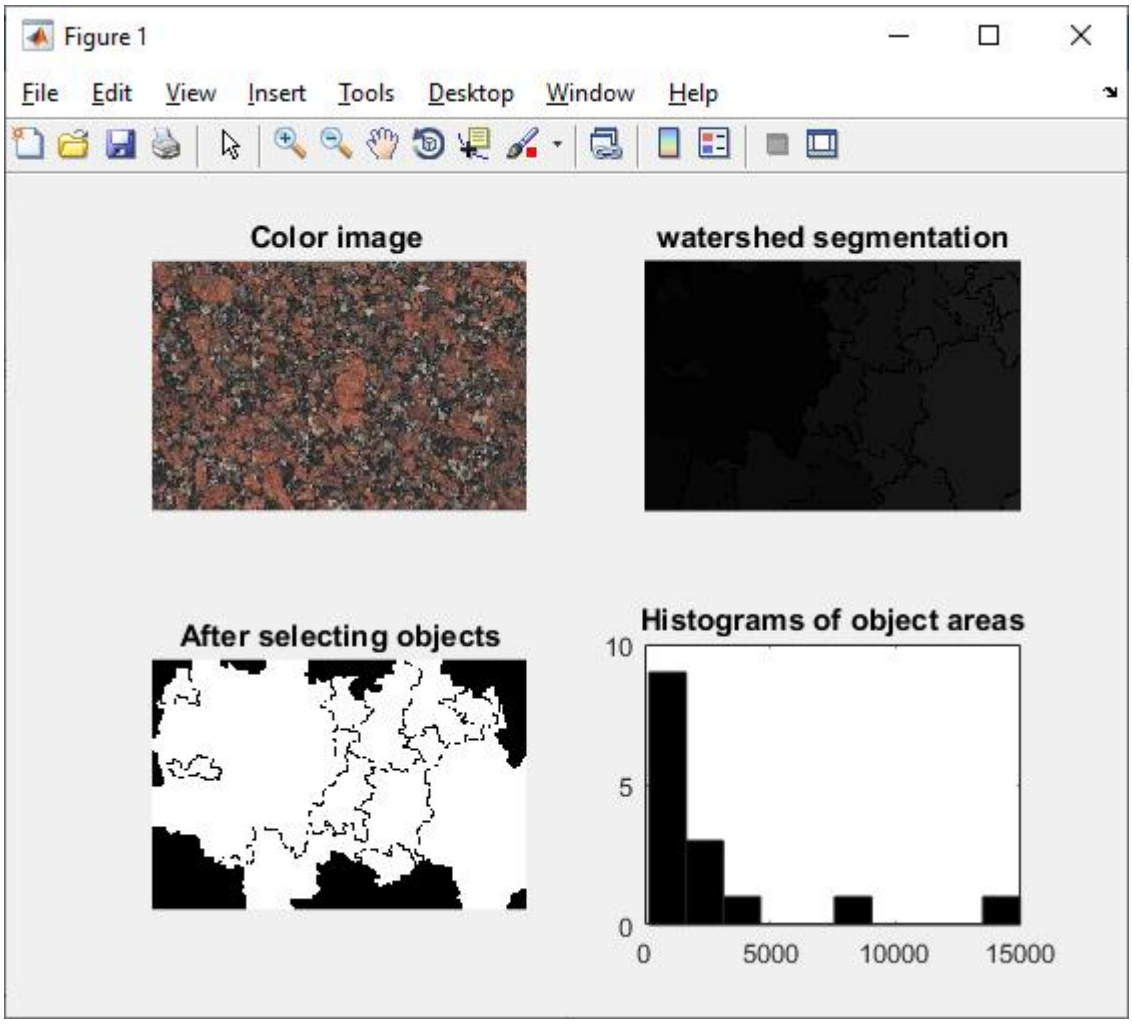
```
%watershed segmentation
rgb=imread('granit.jpg');
  I=rgb2gray(rgb);
 hy=fspecial('sobel');
hx=hy';
Iy=imfilter(double(I), hy, 'replicate');
Ix=imfilter(double(I), hx, 'replicate');
gradmag=sqrt(Ix.^2+Iy.^2);
L=watershed(gradmag);
Lrgb=label2rgb(L);
se=strel('disk', 1);
Io=imopen(I, se);
Ie=imerode(I, se);
Iobr=imreconstruct(Ie, I);
Ioc=imclose(Io, se);
Iobrd=imdilate(Iobr, se);
Iobrcbr=imreconstruct(imcomplement(Iobrd), imcomplement(Iobr));
Iobrcbr=imcomplement(Iobrcbr);
fgm=imregionalmax(Iobrcbr);
 I2=I;
 I2(fgm)=255;
  se2=strel(ones(5, 5));
 fgm2=imclose(fgm, se2);
 fgm3=imerode(fgm2, se2);
  fgm4=bwareaopen(fgm3, 20);
 I3=I;
 I3(fgm4)=255;
 bw=im2bw(Iobrcbr, graythresh(Iobrcbr));
    D=bwdist(bw);
  DL=watershed(D);
  bgm=DL==0;
  gradmag2=imimposemin(gradmag, bgm | fgm4);
   A3=watershed(gradmag2);

    [L num]=bwlabel(A3, 8);% search for objects
feats=regionprops(L, 'Area', 'Centroid');%Calculation of signs of calculations
% of objects: areas and coordinates of centers of mass
% Rewrite character values
% of the array of structures feats into individual arrays.
Areas=zeros(num);
CentX=zeros(num);
CentY=zeros(num);
for i=1:1:num
Areas(i)=feats(i).Area;
CentX(i)=feats(i).Centroid(1);
CentY(i)=feats(i).Centroid(2);
end;
% Forming a binary image from objects,
% whose area is more than 30 pixels and the center of mass of the objects is
removed
% of image boundaries by more than 20 pixels.
[rows cols]=size(A3);
idx=find(Areas>30&CentX>20&CentY>20&CentX<(cols-20)&CentY<(rows-20));
A4=ismember(L,idx);

% search for objects again
[L num]=bwlabel(A4, 8);
```

```
% Calculation of object areas
feats=regionprops(L, 'Area');
I4=I;
  I4(imdilate(L==0, ones(3, 3))|bgm|fgm4)=255; %Markers and object boundaries
superimposed on the original image
    Lrgb=label2rgb(L, 'jet', 'w', 'shuffle');


subplot(2,2,1);imshow(rgb);title('Color image ')%color image output rgb
subplot(2,2,2); imshow(A3);title('watershed segmentation');%output of
segmentation results by watershed A3
subplot(2,2,3);imshow(A4);title('After selecting objects');%Segmentation images
after selecting objects
subplot(2,2,4); hist([feats.Area]);title('Histograms of object areas');%
Construction of histograms of object areas
```

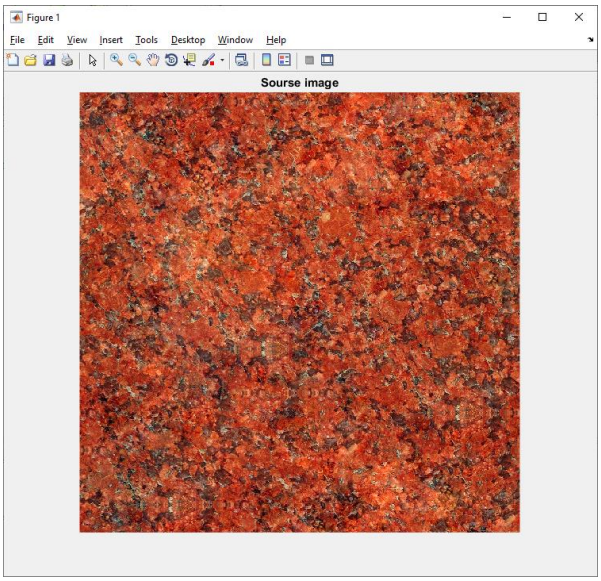


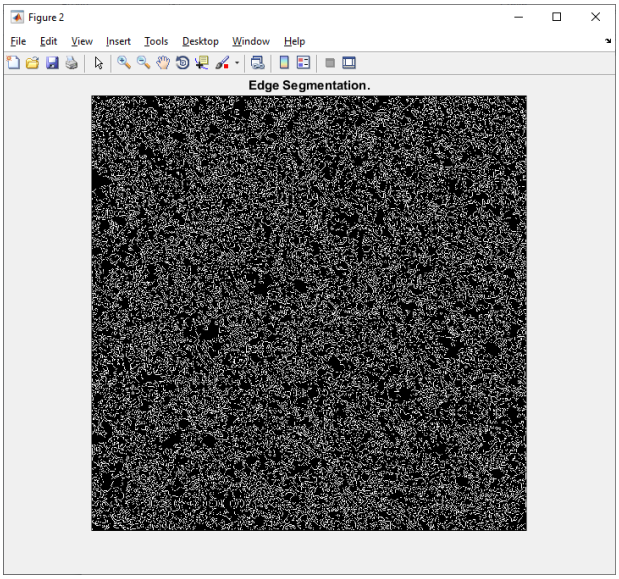
Exercise 5

*Write a program for segmentation by **Edge Segmentation** use the method of sobel, prewitt, roberts, log.*

```
ImageName='granit_red.jpg'; %IM"IMAGE FILE
   type='canny'; % CANNY METHOD
% % METHOD PARAMETERS
   Thresh=0.08; % THRESHOLD FOR OUTLINE DIMENSIONS
 Direction='both';% DIRECTLY
```

```
OrigImage=imread(ImageName);
if ndims(OrigImage)==3
 OrigImage=rgb2gray(OrigImage);
end
[BW1,Tresh1]=edge(OrigImage,Type);
CountEdge1=nnz(double(BW1));
figure,imshow(ImageName);
title('Sourse image');
figure, imshow(BW1);
title('Edge Segmentation.');
```





Exercise 6

*Write a program for segmentation by **Thresholding Segmentation.***