Project 6

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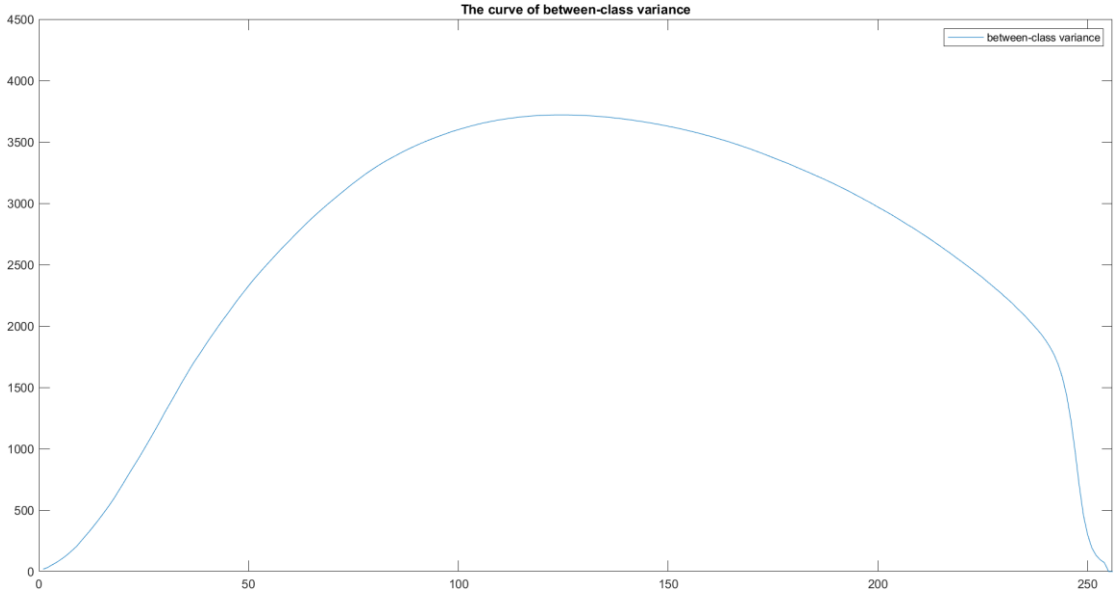
1. Source codes

```
clc;
clear;
close all;
%% read original image
Im = imread('fruit on tree.tif');
% figure('Name','Original image','NumberTitle','off')
% imshow(Im);
[w,h,nChannels] = size(Im);
%Im = im2double(Im);

%% extract R component and Plot of the curve of
between-class variance depending on all possible
threshold values
R_Im = Im(:,:,1);
K = 256;
cts = zeros(K,1);
for i = 1:w
    for j = 1:h
        cts(R_Im(i,j)+1) = cts(R_Im(i,j)+1) + 1;
    end
end
p = cts / sum(cts);
between_class_var = zeros(K,1);
varB = zeros(K,1);
for k = 1:K-1
    P1 = sum(p(1:k));
    P2 = 1 - P1;
    m1 = sum(p(1:k).*(1:k)')/P1;
    m2 = sum(p(k+1:K).*(k+1:K)')/P2;
    between_class_var(k) = P1*P2*(m1-m2)^2;
end
figure('Name','The curve of between-class
variance','NumberTitle','off')
```

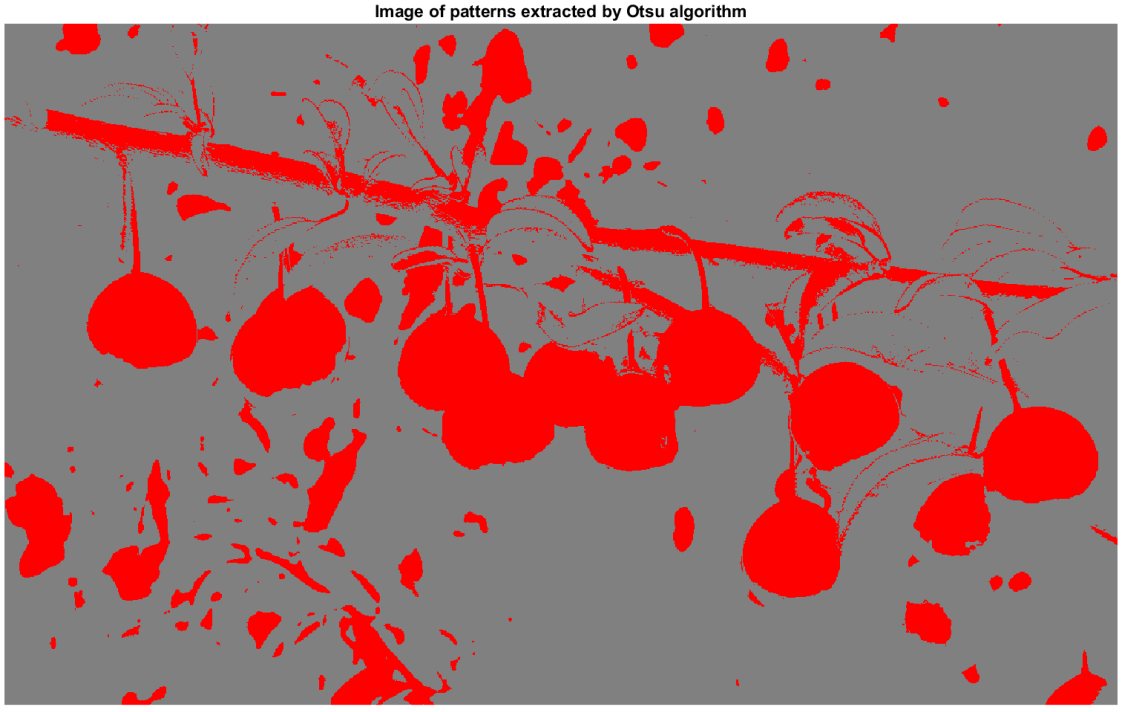
```
axes = plot(between_class_var);
title('The curve of between-class variance')
axis([0 256 0 4500])
legend('between-class variance')

%% Image of patterns extracted by Otsu algorithm
(plotted in the same way as the color-slicing example
shown below)
index = find(between_class_var ==
max(between_class_var));
new_filter_R = zeros(size(R_Im));
bw = imbinarize(R_Im,(index-1)/(K-1));
bw = double(bw);
%imshow(bw)
filter_Im = zeros(size(Im));
for i = 1:w
    for j = 1:h
        if bw(i,j) == 1
            filter_Im(i,j,1) = 1;
        else
            filter_Im(i,j,1) = 0.5;
            filter_Im(i,j,2) = 0.5;
            filter_Im(i,j,3) = 0.5;
        end

    end
end
figure('Name','Image of patterns extracted by Otsu
algorithm','NumberTitle','off')
imshow(filter_Im)
title('Image of patterns extracted by Otsu
algorithm')
%% Images of patterns extracted by K-means clustering
with different threshold values (plotted in the same
way as the colorslicingexample shown below)
threshold = [1,5,10];
for T = threshold
    [L,C] = imsegkmeans(Im,2,'Threshold',T);
```

```
    filter_Im = zeros(size(Im));
    for i = 1:w
        for j = 1:h
            if L(i,j) == 2
                filter_Im(i,j,1) = 1;
            else
                filter_Im(i,j,1) = 0.5;
                filter_Im(i,j,2) = 0.5;
                filter_Im(i,j,3) = 0.5;
            end

        end
    end
    figure;
    imshow(filter_Im);
    title('Images of patterns extracted by K-means
clustering with threshold value='+string(T))
end
```

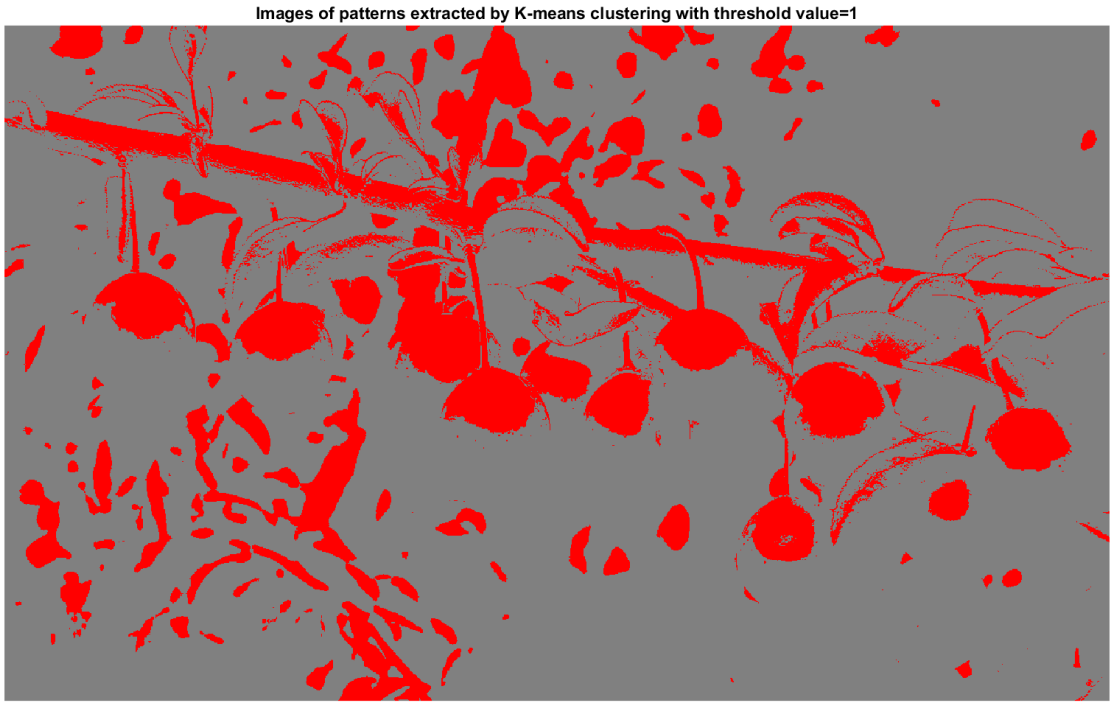
2. Plot of the curve of between-class variance depending on all possible threshold values

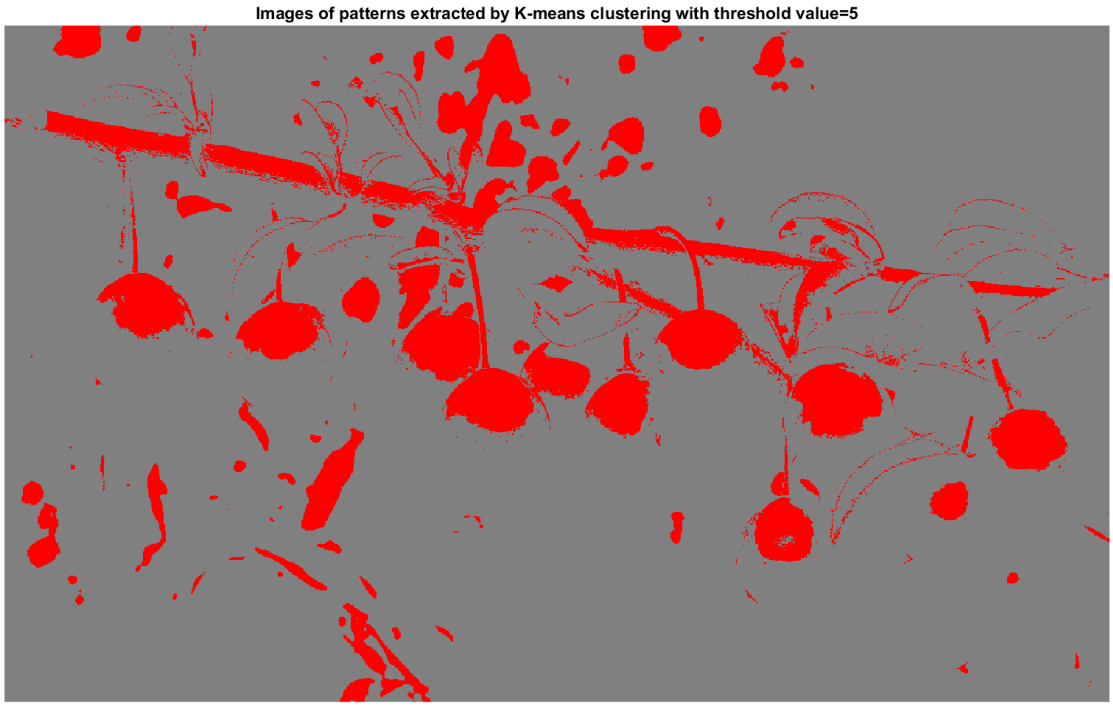


3. Image of patterns extracted by Otsu's algorithm (plotted in the same way as the color slicing example shown below)



4. Images of patterns extracted by K-means clustering with different threshold values (plotted in the same way as the color-slicing example shown below)





Images of patterns extracted by K-means clustering with threshold value=10