CSCE 590 Introduction to Image Processing

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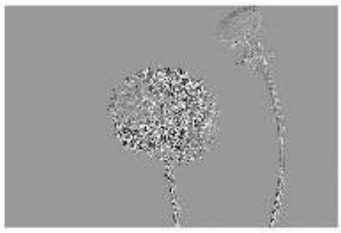
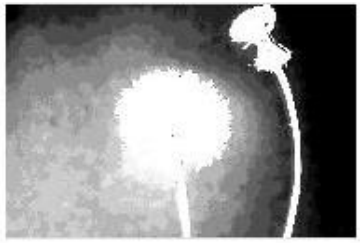
DATE: March 23, 2021
SUBJECT: Assignment 3

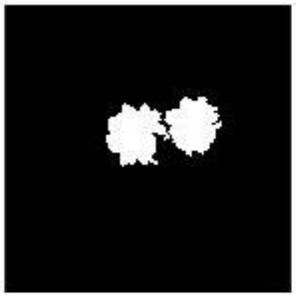
1. Convolution (50.0%)

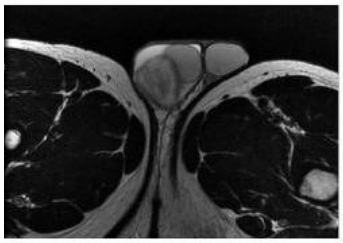
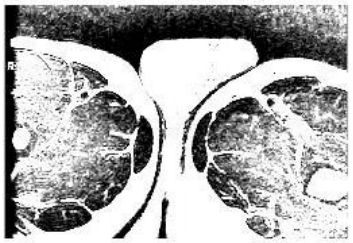
```
k1 = [-1 0 1; -2 0 2; -1 0 1]
k2 = [1 2 1; 0 0 0; -1 -2 -1]

k3 = [0 -1, -1; 1, 0, -1; 1, 1, 0]
k4 = [1, 1, 1; 0, 0, 0; -1, -1, -1]

k5 = [-1 0 1; -2 0 2; -1 0 1]
k6 = [-1 -2 -1; 0 0 0; 1 2 1]

k7 = [2 2 -1; 1 2 1; 1 2 1] / 9
k8 = [-1 -1 0; -1 3 0; 0 0 0]
```



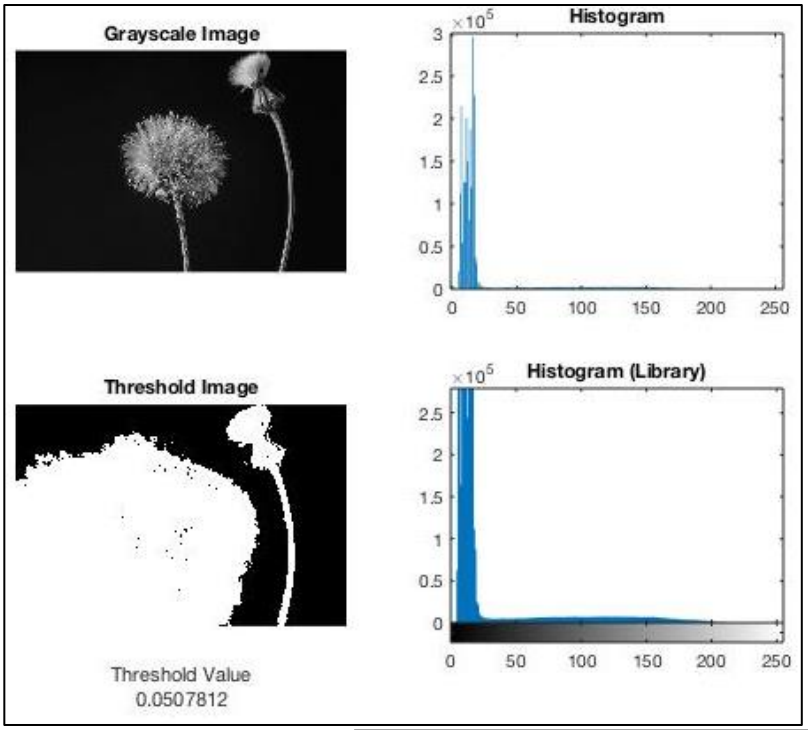
```
k1 = [1 2 3; 4 5 6; 7 8 9]
k2 = [1 2 3; 4 5 6; 7 8 9]

k3 = [1 2 3; 4 5 6; 7 8 9]
k4 = [1 2 3; 4 5 6; 7 8 9]

k5 = [1 2 3; 4 5 6; 0 0 0]
k6 = [1 2 3; 4 5 6; 0 0 0]

k7 = [1 2 3; 4 5 6; 7 8 9] / 9
k8 = [1 2 3; 4 5 6;0 0 0]
```

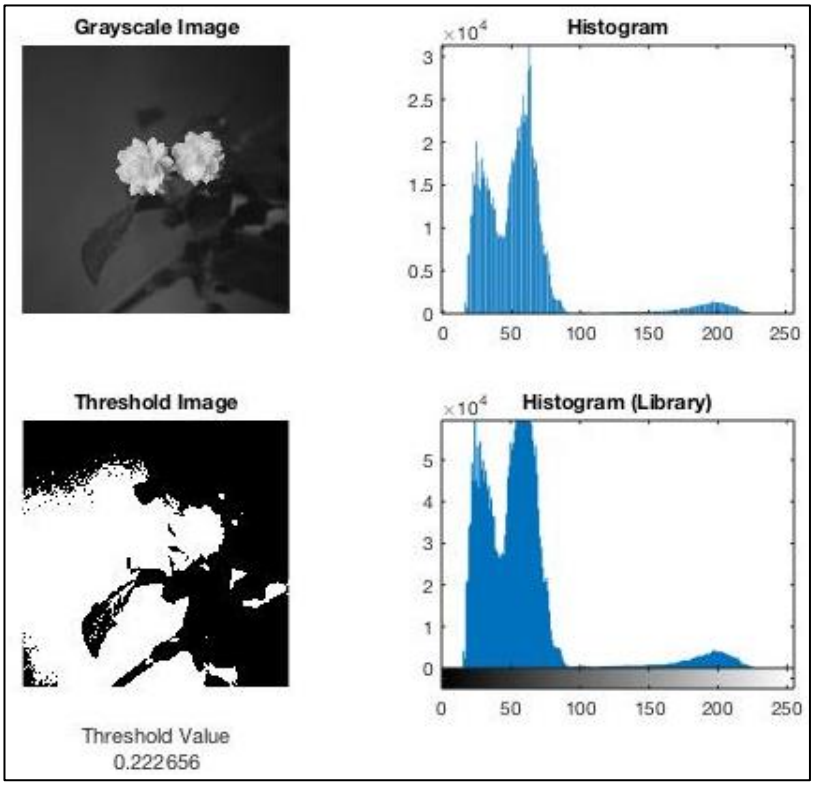


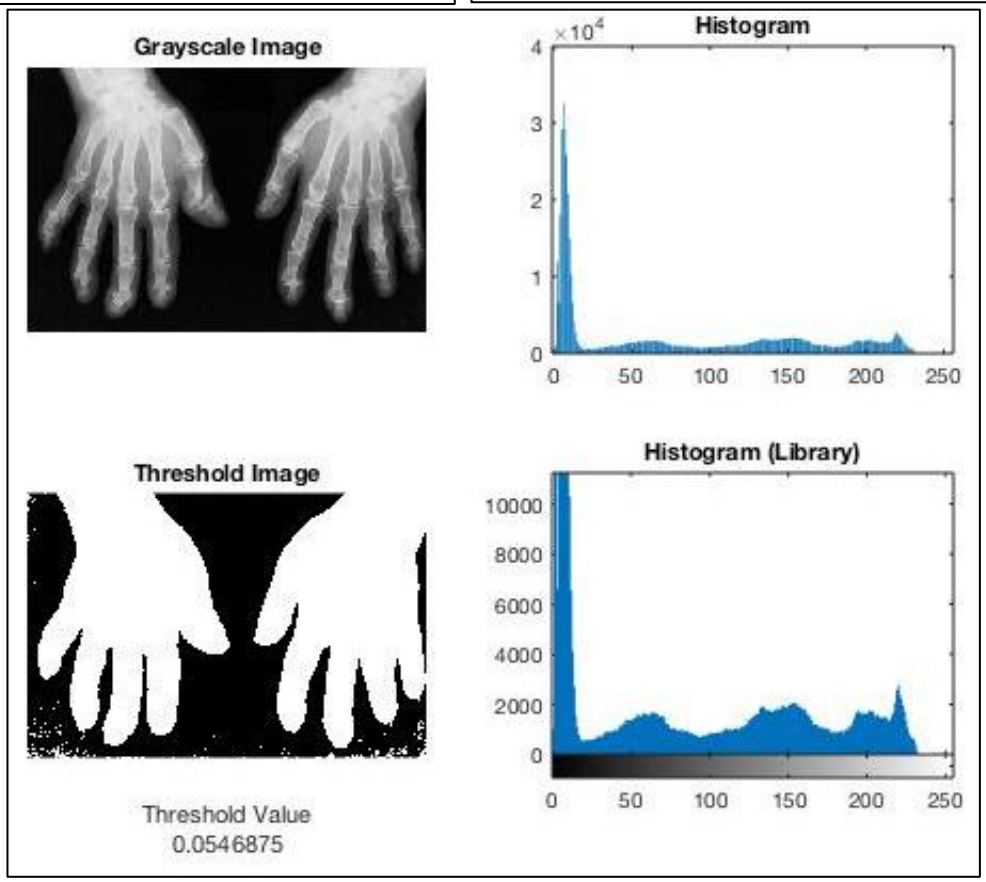


2. Image Segmentation (50.0%)

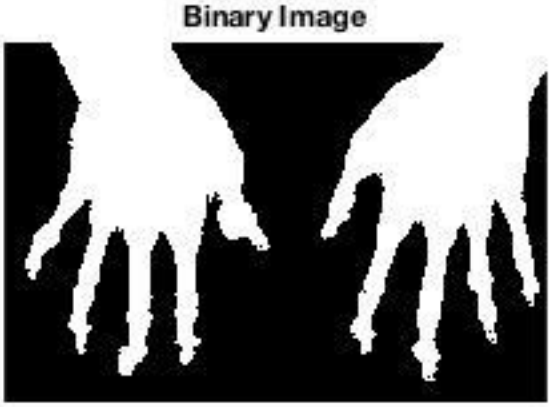


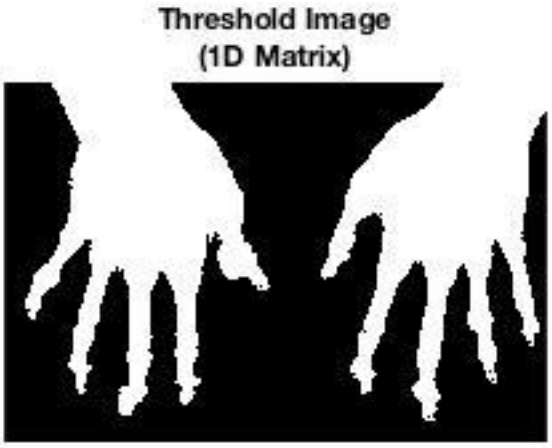


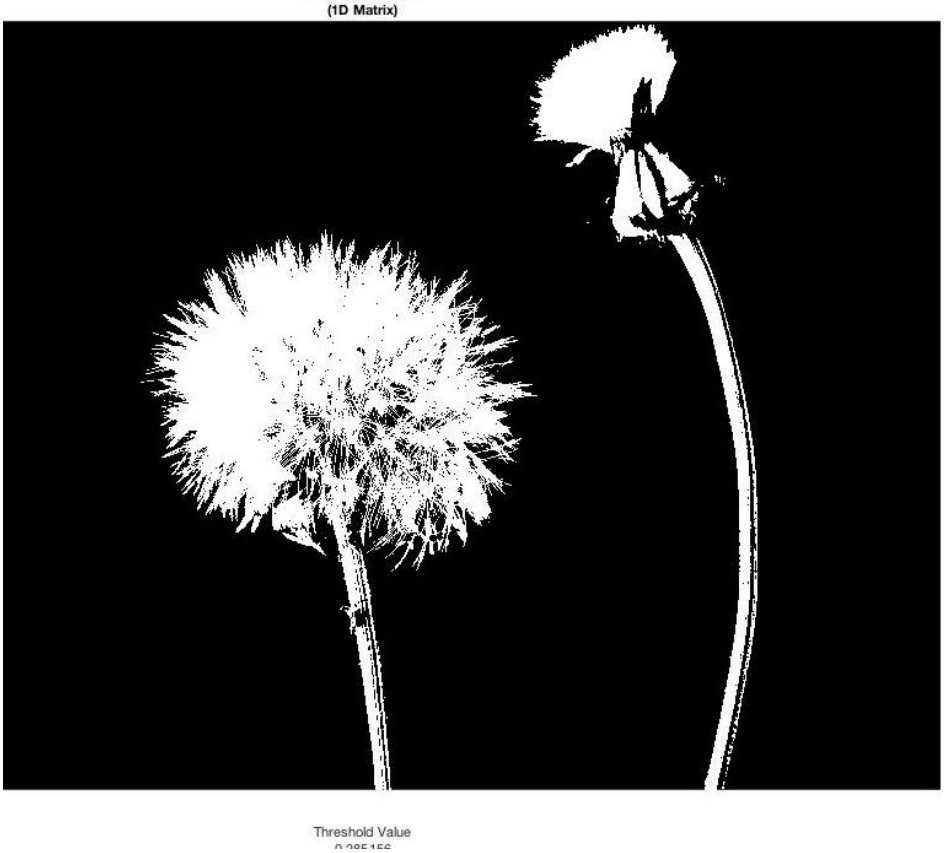


After seeing the result of my thresholding function, I noticed the binary image produced was not properly illustrated when compared to using the built in ‘binarize’ function.

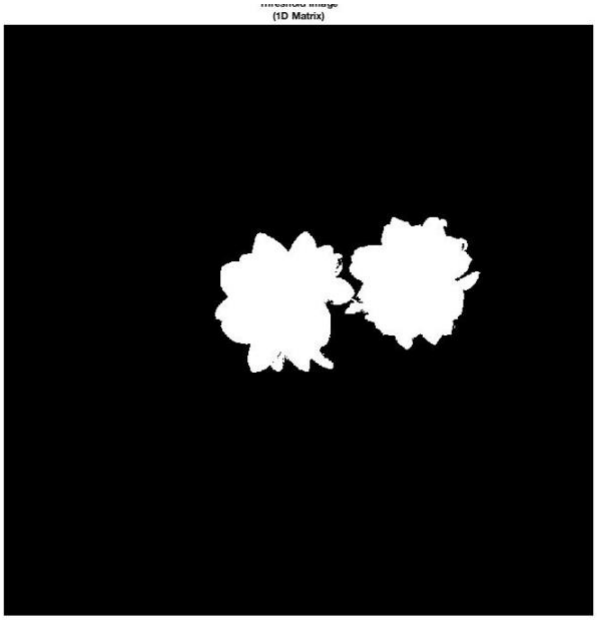
It took me some time to realize that I needed to reshape the image from a 2D Matrix to a 1D Matrix before transforming the image to a histogram and continuing with Otsu’s method for thresholding.







Threshold Value
0.367188



Code:

1.

```
B=imread('gray-2.jpeg');

grayscale = rgb2gray (B);

k1 = [ -1 0 1; -2 0 2; -1 0 1];
k2 = [1 2 1; 0 0 0; -1 -2 -1];

I=double(B);
In=I;

k3=[0, -1, -1; 1, 0, -1;1, 1, 0];
k4=[1, 1, 1;0, 0, 0;-1, -1, -1];
k4=rot90(k3,2);
mask=rot90(k4,2);

input = rgb2gray(B);
input = im2bw(input);
input = double(input);
C = zeros(size(input));

k5 = [-1 0 1; -2 0 2; -1 0 1];
k6 = [-1 -2 -1; 0 0 0; 1 2 1];

for i = 1:size(input, 1) - 2
    for j = 1:size(input, 2) - 2

        G1 =
sum(sum(k5.*input(i:i+2, j:j+2)));
        G2 =
sum(sum(k6.*input(i:i+2, j:j+2)));

        C (i+1, j+1) = sqrt(G1.^2 +
G2.^2);
    end
function untitled4

B=imread('gray-5.jpeg');

// C =reshape(B,[],1);
//2D to 1D Matrix

V1=hist(B,0:255);
G=reshape(V1,[],1);

Ind=0:255;
I1=reshape(Ind,[],1);
res=zeros(size([1 256]));

for A=0:255
    [weightb,varb]=calculate(1,A);
end
subplot(2,2,2)
imshow(C);

if rem(length(k1), 2) == 1
    if rem(length(k2), 2) == 1
        M1 = conv2
(double(grayscale),double(k1)) ;
        M2 = conv2
(double(grayscale),double(k2)) ;

        subplot(2,2,3)
        imshow (( M1 .^2+ M2 .^2)
.^0.5 , []) ;
else
        disp('kernerl dimensions
are NOT odd');
    end
end

f = im2double(imread('gray-
2.jpeg'));
gray = rgb2gray (f) ;
k7 = [ 2 2 -1 ; 1 2 1 ; 1 2 1 ] /
9;
h = conv2(gray, k7);
subplot(2,2,1)
imshow(h);

k8 = [ -1 -1 0 ; -1 3 0 ; 0 0 0 ];
subplot(2,2,4)
imshow(conv2(gray, k8) + 0.6);
```

2.

```
[weightf,varf]=calculate(A+1,255);
res(A+1)=(weightb*varb)+(weightf*va
rf);
end

[~,val]=min(res);
threshval = (val-1)/256

bin = im2bw(B,threshval);
subplot(2,2,1)
imshow(B);
title('Grayscale Image');

subplot(2,2,3);
imshow(bin);
```

```
title('Threshold Image');
xlabel({'Threshold
Value',threshval})

subplot(2,2,4);
imhist(B);
title('Histogram (Library)');
        Temp = B(i,j);
        Histo(Temp+1) =
Histo(Temp+1) + 1;
    end
end

subplot(2,2,2)
bar(0:(2^(Bd) -1),Histo)
title('Histogram');

function
[weight,variance]=calculate(m,n)
weight=sum(G(m:n))/sum(G);

v=G(m:n).*I1(m:n);
total=sum(v);
mean=total/sum(G(m:n));

val2=(I1(m:n)-mean).^2;
num=sum(val2.*G(m:n));
variance=num/sum(G(m:n));

end
end
```

```
Size = size(B);
Bd = 8;
Histo = zeros(1,(2^(Bd)));
for i=1:Size(1)
    for j=1:Size(2)
```