

# Assignment 3

## Segmentation

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### 1 Introduction

In this assignment we are asked to count the number of coins in a provided image.

### 2 Method

Below is a Matlab script that solves the problem of counting coins (and classifying them) presented. Each method is commented why its needed in the script.

```
I=imread('lab3_material/coins.tif');
subplot(2,3,1)
imshow(I) %Display input image

f=[1 1 1 1; 1 1 1 1; 1 1 1 1; 1 1 1 1;]./16; %filter
    away small sharp edges on coin surface
I=imfilter(I,f,'symmetric');
I = medfilt2(I); %Filer away bright pixels.
T = graythresh(I); % Find treshold to mask away
    background
I_2 = im2bw(I,T); % create binary image of
    background and coins

%figure(1)
subplot(2,3,2)
imshow(I_2) %Display binary image

%figure(3)
subplot(2,3,3)
Idist = bwdist(I_2,"euclidean"); %Calculate distance
    to edges
Idist = -Idist; %invert it for the next step
se = strel('disk',5); % try to remove small not
    connected parts of coins
Idist = imerode(Idist,se);
```

```

imshow(Idist,[]);

%figure(5)
subplot(2,3,4)
L = watershed(Idist); %watershed to isolate each coin
    after eroding
L(I_2) = 0; %set background to zero
rgb = label2rgb(L,'spring',[1 1 1]);
imshow(rgb)

%figure(6)
subplot(2,3,5)
T = 0;
I_2 = im2bw(L,T); % create a new binary image with all
    coins separated
imshow(I_2)

%figure(7)
subplot(2,3,6)
Ilabel=bwlabel(I_2,4); % label all objects, coins

stats = regionprops('table',I_2,'Centroid','
    MajorAxisLength','MinorAxisLength'); %get
    properties, center and majoraxis length
centers = stats.Centroid;
diameters = stats.MajorAxisLength;
radii = diameters/2;
imshow(I_2)
hold on
viscircles(centers,radii); %display all objects radii
    with circles, centered with majoraxis length
title('Radii','Interpreter','latex','fontsize',22)
hold off

figure(9)
radii(radii < 17) = []; % remove to small objects
    befor making histogram
hist(radii, 30)

figure(8)
F=regionprops(Ilabel,'Area');
A=[F.Area];
A(A<200) = [];
hist(A)
title('Area','Interpreter','latex','fontsize',22)

```

### 3 Result

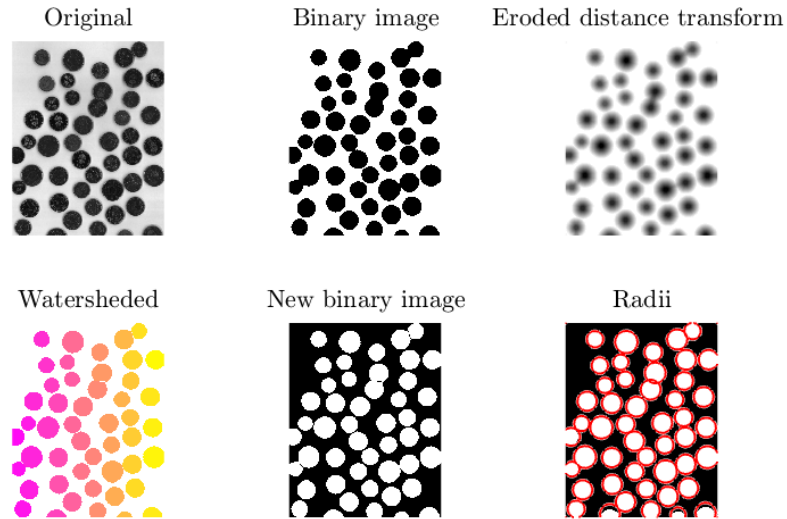


Figure 1: Example of caption

### 4 Result

### 5 Discussion

#### A discussion of errors and limitations in your final method.

The method can count all coins in the image but have problem with classifying one of the coins. Better pre processing to avoid shadows being included as edge of the coin could be one solution.

As you can see, the objects are coins. Is it possible to count the total amount of money using your algorithm? It is possible to count the sum of the money. More complex algorithm would be needed if less than half of the coin is present in the image to correctly classify it with radius. In this model the objects longest axis is used to calculate the radii, by doing this we can approximate the radius and get a good classification of the partial image of the coins.

Explain how your method treat the coins on the image border.

Is your solution general in the sense that it can be used when analyzing images with arbitrary circular objects (i.e. not only coins.tif)?

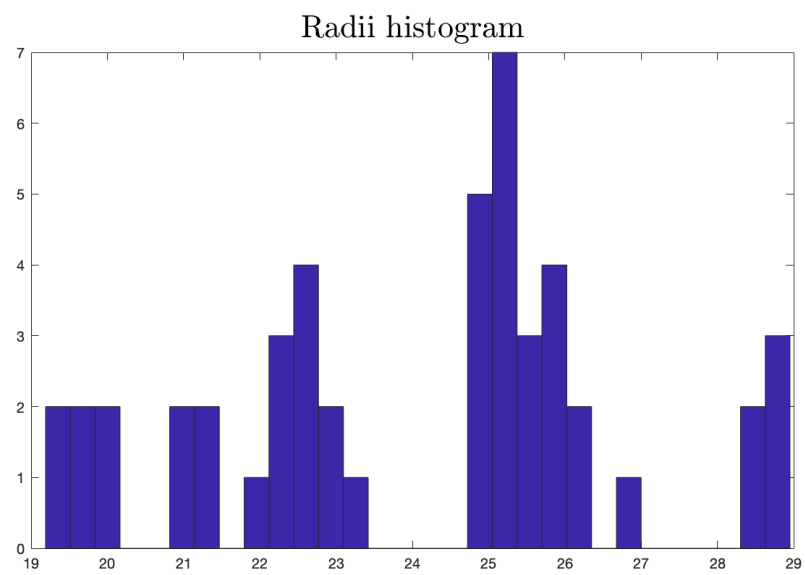


Figure 2: Example of caption