O - OBJEKTE ZÄHLEN

MATLAB MINI PROJECT

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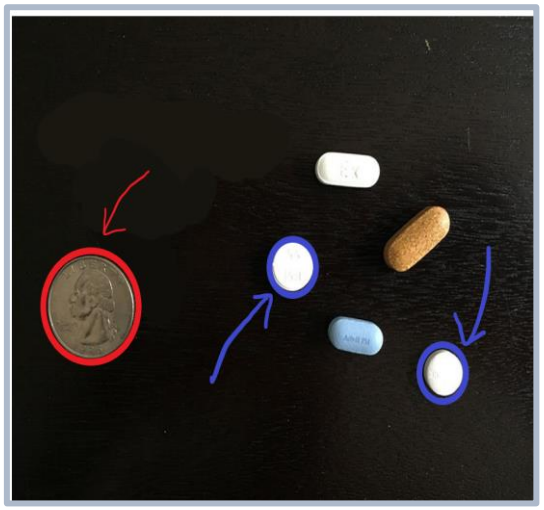
Abstract

- Our project is based on isolation of a circular object from the given image and measuring its radius and also calculating its diameter, area, and circumference.



- It takes the image path as the input and converts it into a matrix that is (Rows x Columns x RGB) and uses the Image Processing Toolbox to identify and highlight the circles in the image within the preset radius range. Also, users can specify their own range of radius for circle detection.
- Two types of circles are identified based on their polarity: Bright circles and Dark circles. Their centers and radii are evaluated and stored.
- Based on the radii matrix obtained, the diameter, area and circumference of the corresponding circles are calculated.
- The graphical analysis of these parameters is displayed at the end which is able to accurately depict their variations with respect to the number of circles.
- Our project has various real-life applications like finding the lost circular object, we can sort out the objects by their details such as their approx., counting cocci organisms, etc.

Code

```
% O - OBJEKTE ZÄHLEN
% MATLAB MINI-PROJECT
%************************************************************


% Clearing workspace and console
clear
clc
close all


% input image
prompt = {'Enter the url of the image or name of the image with its
extension(.png/jpeg)'};
dlgtitle = 'ImagePath';
answer = inputdlg(prompt,dlgtitle);
ImagePath = char(answer);
warning off
Img = imread(ImagePath);
fprintf("\n")
clc;


% circle detection
pause(1)
opts.Interpreter = 'tex';
opts.Default = "YES";
ask = 'Do you want to enter your own range of radius ?';
answer = questdlg(ask,'Radius range', 'YES', 'NO',opts);
clc;
if(answer == "YES")
% dialog box
prompt = {'Enter min range (integer):','Enter max range (integer):'};
dlgtitle = 'Input Radius range';
dims = [1 35; 1 35];
an = inputdlg(prompt,dlgtitle,dims);
z = isnumeric(an);
if (z == 1)
[Lrange, Urange] = an{:};
Lrange = str2double(Lrange);
Urange = str2double(Urange);

% detection using imfindcircles
[cB,Radius] = imfindcircles(Img,[Lrange
Urange],'ObjectPolarity','bright','Sensitivity',0.9);
[cD,radius] = imfindcircles(Img,[Lrange Urange],'ObjectPolarity','dark');
clc;
else
[cB,Radius] = imfindcircles(Img,[20
500],'ObjectPolarity','bright','Sensitivity',0.9);
[cD,radius] = imfindcircles(Img,[20 500],'ObjectPolarity','dark');
end
```

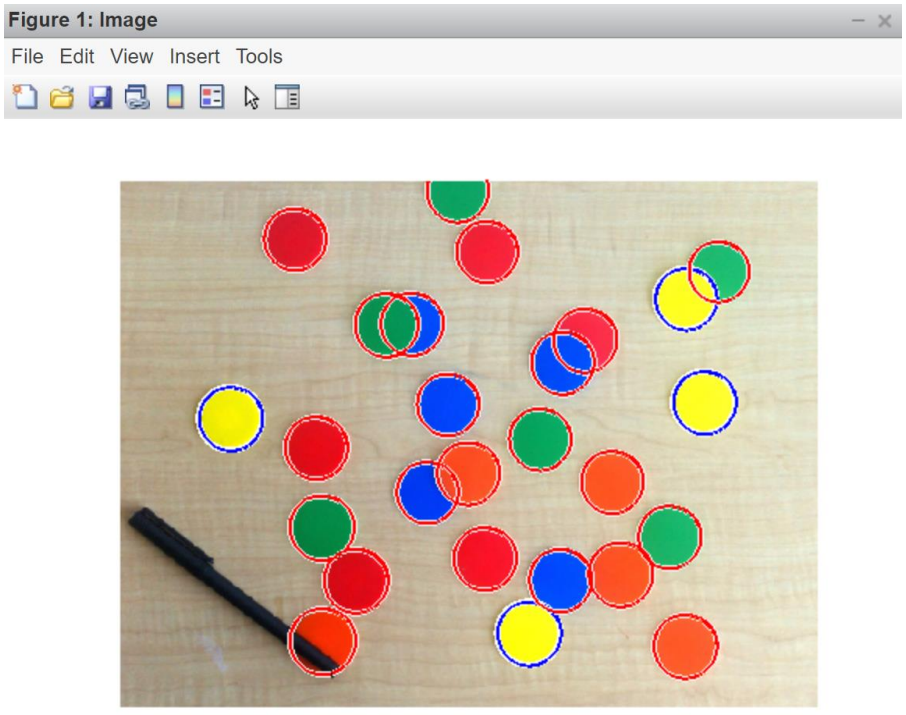
```
else
[cB,Radius] = imfindcircles(Img,[20
500],'ObjectPolarity','bright','Sensitivity',0.9);
[cD,radius] = imfindcircles(Img,[20 500],'ObjectPolarity','dark');
end


% displaying image and marking circles
figure ("Name",'Image');
imshow(Img);
hold on;
viscircles(cB, Radius,'Color','b');
hold on;
viscircles(cD, radius,'Color','r');
hold off;


% measurements
x = length(Radius);
y = length(radius);


total = x + y;
fprintf('The total number of circles in the image are: %d\n\n',total);
fprintf('************************************************\n')


% for bright circles
if (x>0)
for i = 1:x
Diameter = 2.*Radius;
Area = (4*pi).*(Radius).^2;
Circumference = (2*pi).*Radius;
end
else
Diameter = 0.*Radius;
Area = 0.*Radius;
Circumference = 0.*Radius;
end
% for dark circles
if (y>0)
for j = 1:y
diameter = 2.*radius;
area = (4*pi).*(radius).^2;
circumference = (2*pi).*radius;
end
else
diameter = 0.*radius;
area = 0.*radius;
circumference = 0.*radius;
end
```

```
% tables
Circle_no = (1:x)';
circle_no = (1:y)';
% table 1
BT = table(Circle_no, Radius, Diameter, Area, Circumference);
fprintf("Bright circles: \n\n");
disp(BT)
fprintf('\n***********************************************\n')
% table 2
DT = table(circle_no, radius, diameter, area, circumference);
fprintf("Dark circles: \n\n");
disp(DT)

% graphical analysis
% dialog box
pause(7)
opts.Interpreter = 'tex';
opts.Default = "YES";
Answer = questdlg('Do you want to view the Graphical analysis ?','Graphical
analysis', 'YES', 'NO',opts);
if(Answer == "YES")
    figure ('Name', 'Graphical analysis');
    tiledlayout(2,2, 'TileSpacing', 'none')
    % Tile 1
    nexttile
    plot(1:1:x, Radius,'r.-', 1:1:y, radius,'b.-')
    ylabel('R \rightarrow');
    title('Radius');
    % Tile 2
    nexttile
    plot(1:1:x, Diameter, 'r.-', 1:1:y, diameter, 'b.-')
    ylabel('D \rightarrow');
    title('Diameter');
    % Tile 3
    nexttile
    plot(1:1:x, Area,'r.-', 1:1:y, area,'b.-')
    ylabel('A \rightarrow');
    title('Area');
    % Tile 4
    nexttile
    plot(1:1:x, Circumference,'r.-', 1:1:y, circumference,'b.-')
    ylabel('P \rightarrow');
    title('Circumference');
    legend(nexttile(2),'bright circles', 'dark circles', 'Location',
'northoutside');
end
%*********************************************************************************

% test image links
%1.https://www.herocycles.com/admin/public/uploads/bestseller/5f045807aecefdRluFu0
mPF.jpeg
% 2. coloredChips.png
% 3. https://encrypted-
tbn0.gstatic.com/images?q=tbn:ANd9GcTqj2XSQWNVk8dVvTqua2F3abR4CZijLhFgjQ&usqp=CAU
```

Output

Image provided:

Output:



COMMAND WINDOW

The total number of circles in the image are: 26

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Bright circles:

Circle_no	Radius	Diameter	Area	Circumference
1	23.516	47.032	6949.2	147.76
2	23.558	47.116	6974.1	148.02
3	22.784	45.569	6523.6	143.16
4	23.213	46.425	6771.1	145.85

****

Dark circles:

circle_no	radius	diameter	area	circumference
1	22.874	45.749	6575.3	143.72
2	22.727	45.455	6491	142.8
3	23.229	46.458	6780.6	145.95
4	22.933	45.866	6609	144.09
5	23.229	46.458	6780.7	145.95
6	23.243	46.487	6789.1	146.04
7	23.522	47.043	6952.5	147.79
8	22.882	45.765	6579.8	143.77
9	23.141	46.282	6729.4	145.4
10	23.187	46.374	6756.2	145.69
11	22.794	45.588	6529	143.22
12	23.767	47.533	7098.1	149.33
13	23.091	46.182	6700.3	145.08
14	23.111	46.222	6712	145.21
15	22.336	44.672	6269.2	140.34
16	23.513	47.026	6947.4	147.74
17	23.933	47.866	7197.8	150.37
18	23.79	47.58	7112.1	149.48
19	24.407	48.814	7485.9	153.35
20	22.876	45.751	6576	143.73
21	23.463	46.926	6917.8	147.42
22	23.16	46.321	6740.7	145.52

``

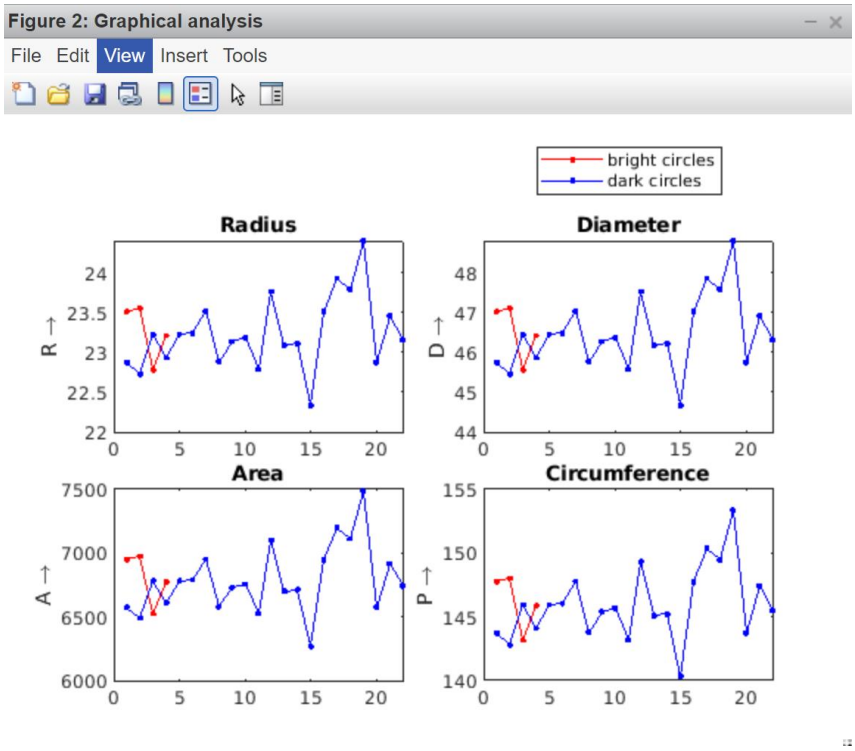
Figure 2: Graphical analysis
File Edit View Insert Tools
bright circles
dark circles
Radius
R →
Diameter
D →
Area
A →
Circumference
P →

Thank you