



Project Title: Using MATLAB to Measure the Diameter of an Object within an Image

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Abstract:

Measuring objects within an image or frame can be an important capability for many applications where computer vision is required instead of making physical measurements.

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Using MATLAB to Measure the Diameter of an Object within an Image

INTRODUCTION:

MATLAB is a high-level language and interactive environment for computer computation, visualization, and programming. Image Processing Toolbox is an application available for use in MATLAB, which provides a comprehensive set of reference-standard algorithms, functions, and apps for image processing, analysis, visualization, and algorithm development.” Using these tools provides a fast and convenient way to process and analyze images without the need for advanced knowledge of a complex coding language.

OBJECTIVE:

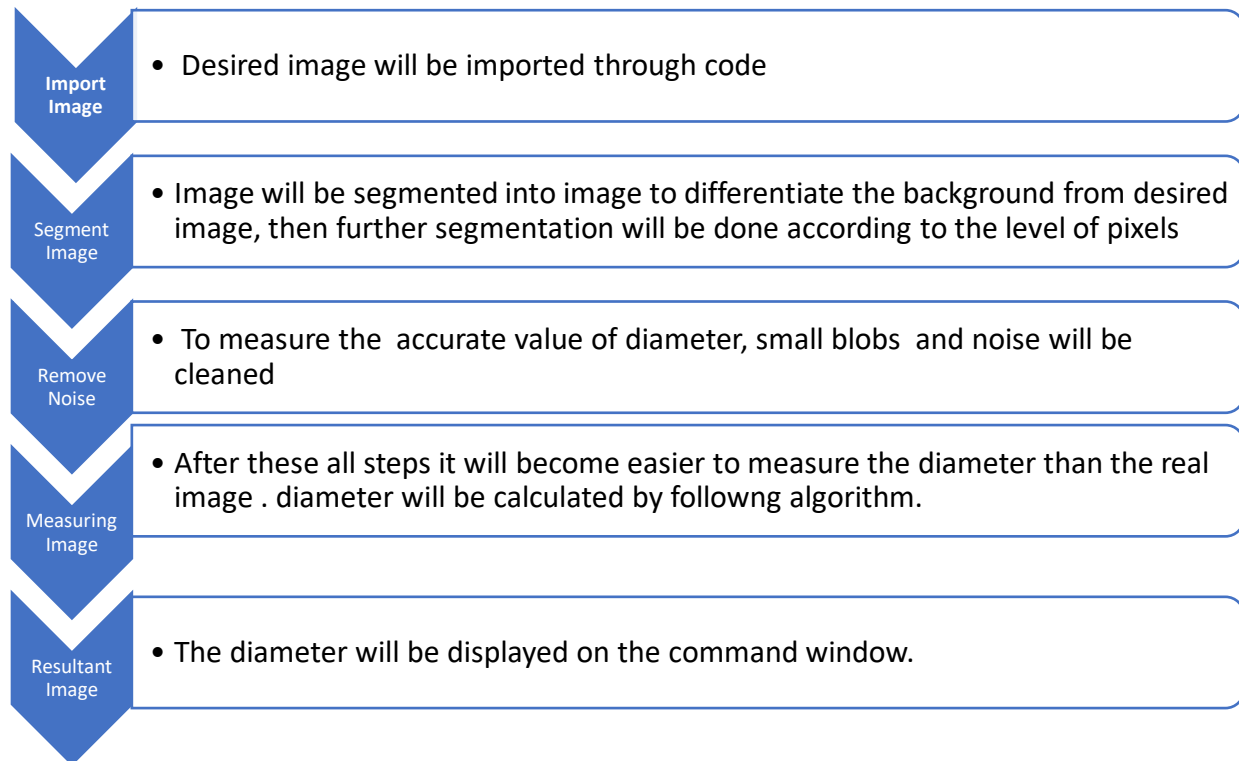
This application note will cover a basic step-by-step algorithm for isolating a desired object and measuring its diameter. Through this application note you will be able to write a MATLAB script file to import an image, segment the image in order to isolate the desired object from its background and then use the MATLAB functions that come with the Image Processing Toolbox to determine the objects diameter. It is assumed in this Application Note that the reader has a basic knowledge of MATLAB.

TOOLS:

- MATLAB 2018a
- Image processing Toolbox
- Windows XP or better
- Or Mac OS X Lion or better
- Intel or AMD x86 processor
- 4 GB or better disk space
- 2048 MB RAM at least recommended
- Hardware accelerated graphics card supporting OpenGL 3.3
- 1 GB GPU memory recommended

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WORKING:



METHODOLOGY:

Step#01: Import Image

Open the MATLAB software and in the application section; download the Image Processing Tool Box. Create a new MATLAB script file. It is important that the Current Folder that you are working out of be the folder that contains both the script file and image. The command “**imread**” reads an image and converts it into a “3-dimensional” matrix in the RGB color space that is 401x534x3 (Rows x Columns x RGB). Here we will take example of a ball image. The final dimension (RGB) corresponds to a red, green and blue intensity level. Use “**imshow**” to view the produced image in a new window.

```
clear;  
clc;  
obj=imread('D:\Academic\5th  
imshow(obj)  
Segment image
```



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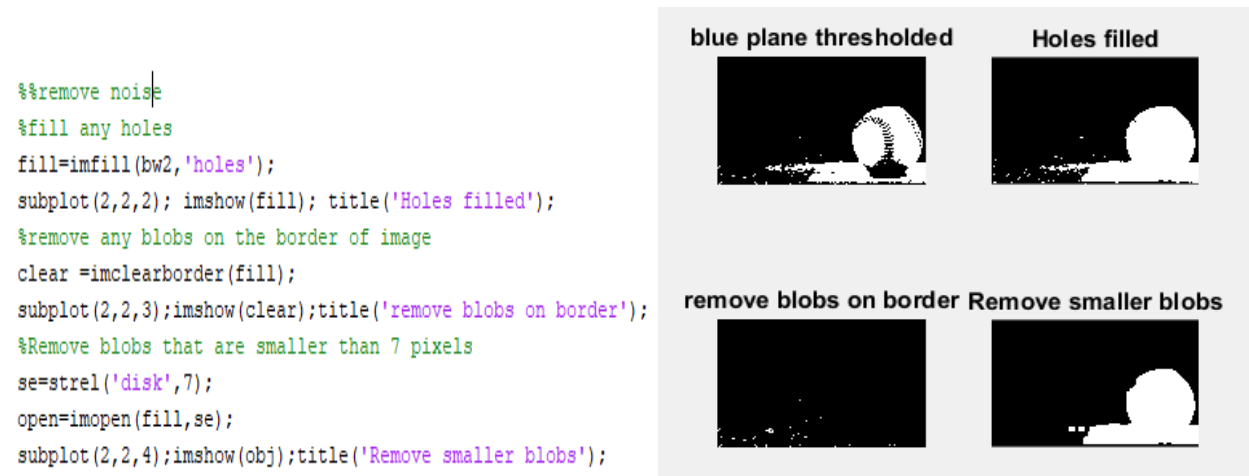
Step#02:Segment Image

The first step taken is to divide the image into three images based on the intensities of each red, green and blue component within the image. This is Color Based Image Segmentation. We will choose the blue plane because it is the best choice for Image Thresholding as it provides the most contrast between the desired object (foreground) and the background. Image Thresholding takes an intensity image and converts it into a binary image based on the *level* desired. A value between 0 and 1 determines which pixels (based on their value) will be set to 1 (white) or 0 (black). Set the increment value to 0.01 and choose the best value at which to threshold.



Step#03:Remove Noise

we need to clean the image up significantly to improve the accuracy of our diameter measurement. The procedures taken to clean up the image and provide a more uniform blob to analyze. Blobs in this document are any collection of white pixels that touch to create a cohesive and distinct object.



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Step#04:Measuring Image

After all the procedures of image segmentation and cleanup procedures to provide one distinct and cohesive blob, which represents the ball in the original image. Having the original image in a binary form such as this will make it easy for other functions built into MATLAB to quickly analyze the region and a host of different information. The “**regionprops**” function is the tool that will provide the “**MajorAxisLength**” of the blob in the image.

```
subplot(2,2,1), imshow(obj), title('Remove Smaller  
%%measure object diameter  
diameter = regionprops(open, 'MajorAxisLength');  
%show result  
figure(3)  
imshow(obj)  
%include a line to physically measure the ball  
d=imdistline;
```

RESULT:

The diameter will be displayed on the command window.

