**DIP MINI PROJECT**

**REPORT**

**Measuring the Diameter of an Object within an**

**Image**

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**Objective**

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. This application note will cover a basic step-by-step algorithm for isolating a desired object and measuring its diameter.

MATLAB is used to import an image, segment the image in order to isolate the desired object from its background remove all the nise presnt in it and use the matlab functions to measure the diameter of the object within the image.

**METHODS INVOLVED**

IMPORTING THE IMAGE

SEGMENTATION OF THE IMAGE

REMOVING THE NOISE

MEASURING THE IMAGE

**Import Image**

. The command *imread* reads an image and converts it into a “3-dimensional” matrix in the RGB color space. The image used is ball.jpg which is a 534 by 401 pixel image. The *imread* function converts this into a matrix that is 401x534x3 (Rows x Columns x RGB). The final dimension (RGB) corresponds to a red, green and blue intensity level. Use *imshow* to view the produced image in a new window.

**Segment Image**

Segment the image into a binary image to differentiate the background from the desired objects. 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. The blue plane is the best choice to use for Image Thresholding because 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 a 1 (white) or 0 (black)). To choose the best value ”. In this case the image has been thresholded at 0.37.Finally the image has been segmented between the object we desire to measure and the background.

**Segmentation Continued (Remove Noise)**

As you can see from the top-left image in *Figure 6* there is quite a bit of “noise” and we need to clean the image up significantly to improve the accuracy of our diameter measurement. on 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. The Matlab 'imfill' function isused to fill the holes

'imfill function':

BW2 = imfill(BW,'holes') fills holes in the input binary image BW. In this syntax, a hole is a set of background pixels that cannot be reached by filling in the background from the edge of the image.

Filling Holes

A common use of the flood-fill operation is to fill "holes" in images. For example, suppose you have an image, binary or grayscale, in which the foreground objects represent spheres. In the image, these objects should appear as disks, but instead are donut shaped because of reflections in the original photograph. Before doing any further processing of the image, you may want to first fill in the "donut holes" using imfill.

Because the use of flood-fill to fill holes is so common, imfill includes special syntax to support it for both binary and grayscale images. In this syntax, you just specify the argument 'holes'; you do not have to specify starting locations in each hole.

Blobs removal

Blobs are any collection of whitepixels the touch to create a cohesive and distinct white object.Removal of blobs are done using the morphological funtion 'imopen'.J = imopen(I,SE) performs morphological opening on the grayscale or binary image I, returning the opened image, J.The morphological open operation is an erosion followed by a dilation, using the same structuring element for both operations. The ' SE' is used as the single structuring element.For example, SE= strel('disk',7) chooses the pixel as 7 ad removes all the blobs that are smaller than 7 pixels. this is how the 'imopen' function works.

**Measuring Image**

The result of all 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 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., the diameter is displayed

regionprops

regionprops is a very useful function . regionprops measures a variety of image quantities and features in a black and white image. Specifically, given a black and white image it automatically determines the properties of each contiguous white region that is 8-connected. One of these particular properties is the centroid.

Length (in pixels) of the major axis of the ellipse that has the same normalized second central moments as the region, returned as a scalar.

**Results**

The diameter is now displayed in the Command Window to be approx. This was verified by using the *imdistline* function . The 'imdistline' function is a user interactive tool that measures the diameter manually and can be used for accuracy.

Hence the diameter and size of a 3 D object defined in the 2D sapce of an image can be found using the above methods. This has got a variety of applications in real life such as measuring the size of tumor in human body of the size of cracks and vents in pipelines or railway tracks etc.