Recognition of Geometrical Shapes Using Inclination and Statistical Features

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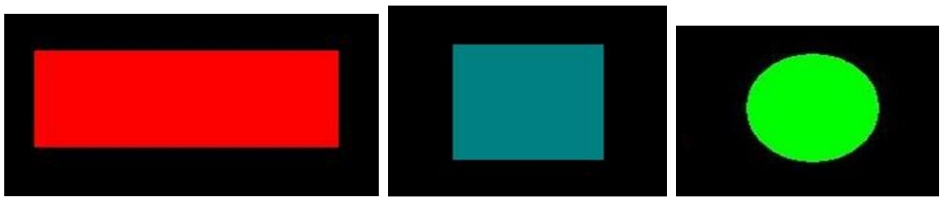
Abstract- Shape recognition is one of the key aspects in Computer vision, from different point of views problems of object recognition have been resolved and some of the modifications in the recognition technique is still going on. In this paper we consider five shapes such as rectangle, square, triangle, circle and ellipse, we use boundary based technique as well as the color of the object to identify the shape of the object. For every object we perform pre-processing, inclination of object and statistical features like height, width, aspect ratio, skewness, standard deviation, and mean values. An experimental result shows that 90% of identification rate and our method is superior than existing methods in terms of recognition.
Keywords – Preprocessing, inclination, statistical features, identification, recognition.

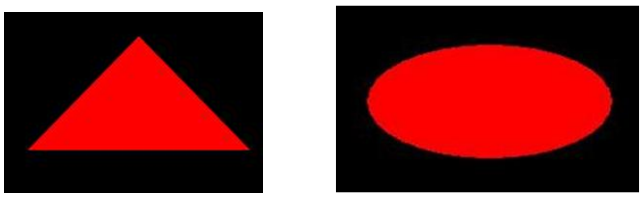
I. INTRODUCTION

In an image, shape plays a significant role. The shape of an image is one of the key information when the eye recognizes an object. A Shape is the form of an object or its external surface, as opposed to other properties such as color, texture, or material composition. In an image, shape plays a significant role. In a computer system, a shape of an object can be interpreted as a region encircled by an outline of the object. Shape recognition is one of the key aspects of computer vision. From the different points of view problems of object recognition have been resolved and some of the modifications in the recognition technique is still going on. In our project, two techniques of shape recognition have been defined such as, area based and boundary based technique. In the area based technique, all pixels within the region of the image are taken into consideration to get shape representation. Boundary based technique focuses mainly on object boundary and geometrical features like image features such as, height, width, area, aspect ratio, standard deviation and skewness of the object.

In this paper we use two types of data sets figure 1(a-e), hand drawn geometric shapes using paint brush and our own data set figures 2(a-e).

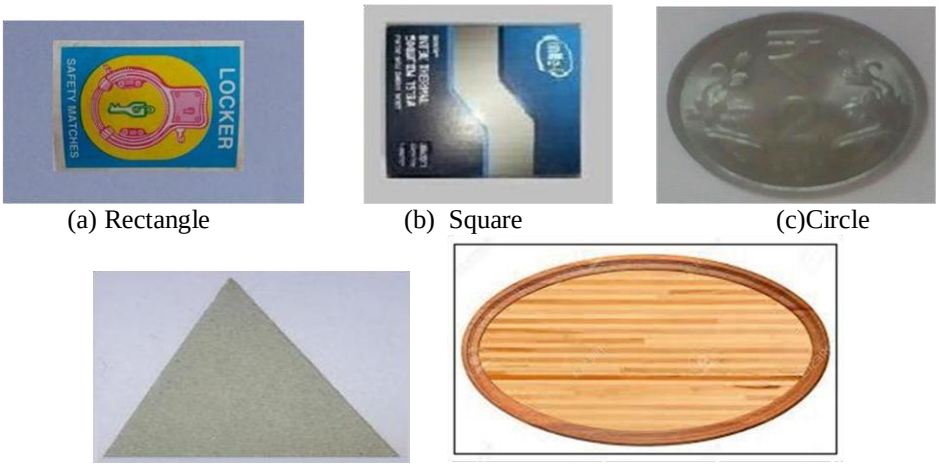


(a) Rectangle (b) Square (c) Circle



(d) Triangle (e) Ellipse

Figure 1: Dataset used for shape identification (hand drawn using ms paint)



(a) Rectangle (b) Square (c)Circle

(d) Triangle (e) Ellipse

Figure 2: Data set used for shape identification (Digital camera)

The basic idea behind doing a literature survey is to gain knowledge regarding the related work. As was in our case, several research papers were taken into consideration and studied. Stress is laid to summarize the concept of different authors who have worked in this field. A number of shape recognition algorithms have been proposed in the past. A detailed survey of shape recognition algorithms can be found.In Object recognition can be done in several ways: (1) Comparing every pixel in the image to the pixels of a number of other images stored in the processor's memory and (2) Extracting information from the image. (3) Fuzzy techniques and back propagation neural algorithm. (4) Real-time neural networks, (5) fuzzy and neural techniques etc… The first method involves the conversion of RGB image to gray scale image and then to black and white image. This paper attempts at demonstrating the shape and color recognition of an object using an algorithm which will be explained in detail

II. PROPOSED ALGORITHM

In this digital image processing and geometric logic for recognition of two dimensional shapes of objects such as squares, circles, rectangles, ellipse and triangle as well as the color of the object. In this, for every object, we perform pre-processing steps. By this two-dimensional shape, we are going to identify the shape and by changing the angles for every object. The object has different angles though the object should identify with the original shape of the object.

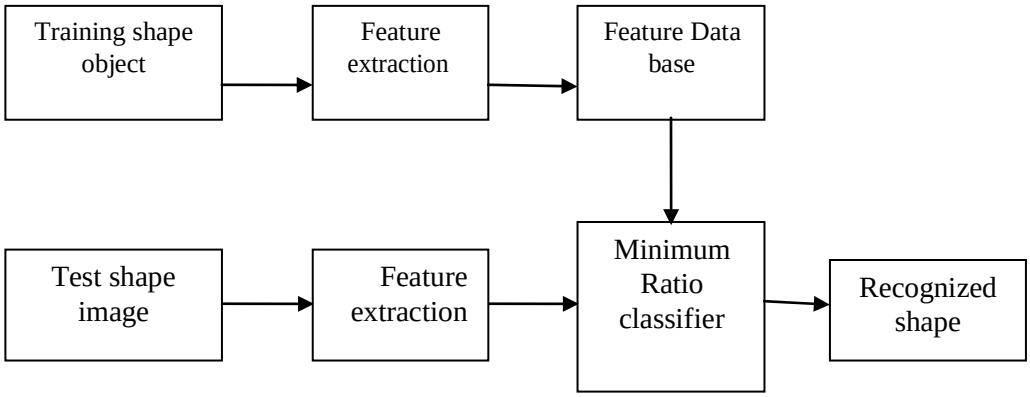


Figure 3: Shape recognition systems

In figure 4 shows that, consider the input images are converted to a gray image. From the gray image, it is used to do the morphological operation and find the shape features of binary image objects like height, width, aspect ratio, standard deviation, mean and skewness and change the angle in clockwise and anticlockwise direction. If once finding features of shapes compare the values and also bounding box of angle changed objects. In our project depending upon aspect ratio we identify the shape of objects. In triangle shape of an object by having the threshold values for the aspect ratio by fixing our own values. Under this values of aspect ratio is greater than 0.3 to less than 1.3(AR>0.3&&<1.3) if it is yes it is a triangle and otherwise check the other shapes conditions. In rectangle shape of

an object by having the threshold values for the aspect ratio by fixing our own values Under this values of aspect ratio is greater than 1.5 to less than 2.6(AR>1.5&&<2.6) if it is yes it is a rectangle and otherwise check the other shapes conditions. In square shape of an object by having the threshold values for the aspect ratio ==1 Under this values of aspect ratio==1.if it is yes it is a square. In circle shape of an object by having the threshold values for the aspect ratio 0.9 to1. Under this values are present. if it is yes it is a circle otherwise an ellipse.

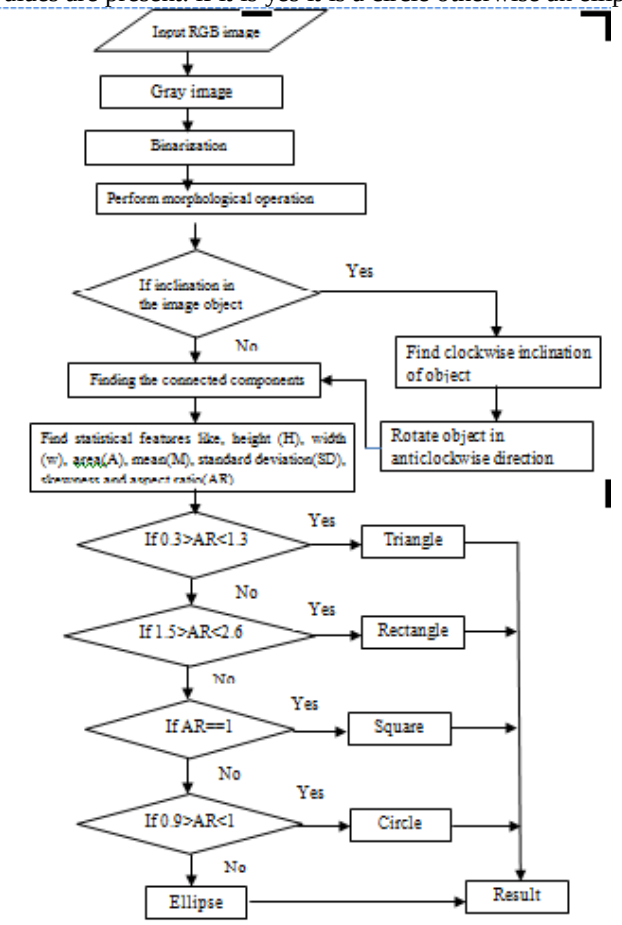
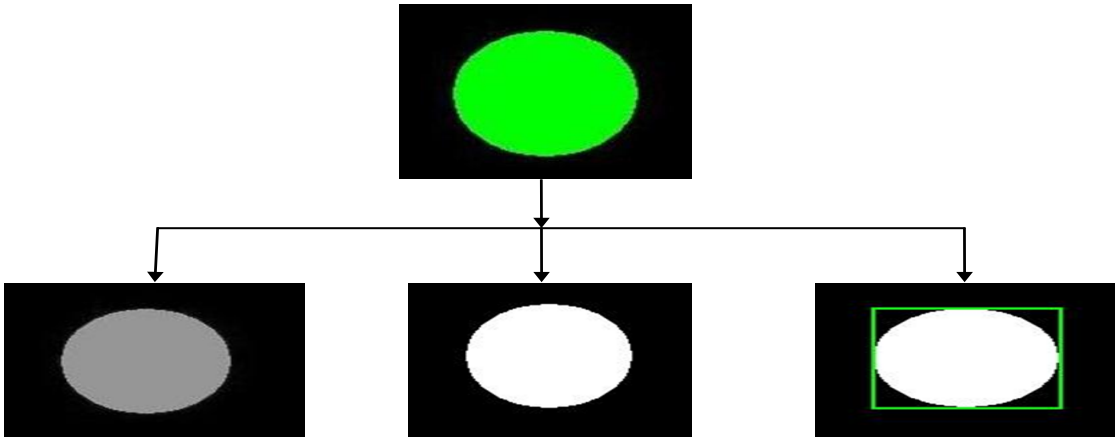


Figure 4: Flowchart showing the various steps of proposed method.

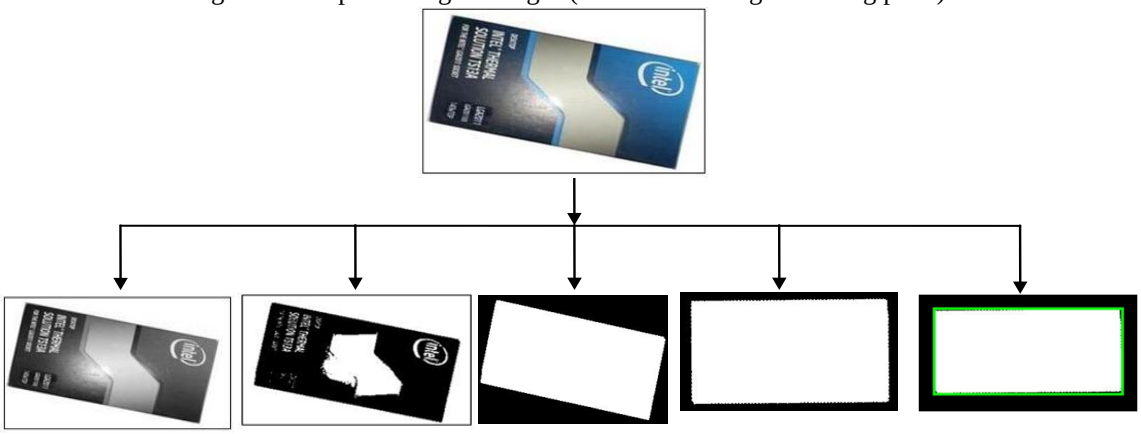
III. EXPERIMENT AND RESULT

Pre-processing is a technique in which foreground of the image is separated from its background figure 5-7. Here we have used threshold method to separate circle shape object from its background. The sample images are taken on a dark, uniform colored black background; the intensity of the background pixels is lower than that of the foreground pixels of the shape of objects. Therefore, shape area can be separated easily from the background



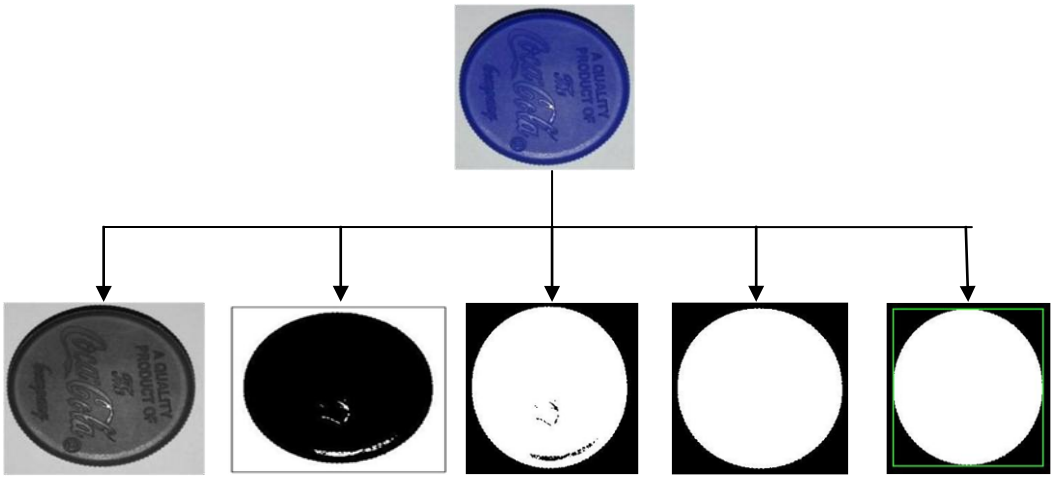
Gray image Binarization image Bounding box

Figure 5: Pre-processing of images (hand drawn image for using paint)



Gray image Binarization image Filled image Rotated image Bounding box inclination

Figure 6: Pre-processing of Images (Rotated image)



Gray image Binarization image Inverted image Filled image Bounding box

Figure 7: Pre-processing of Images (using Digital camera)

In figure 7 shows that capturing the rectangle shape of the object has an input image for using digital camera. The RGB image is converted to gray image, then gray image is converted to binarization of images, then binary images are converted to inverted images, and then apply morphological operation of filled image, the inclination of an object then is finally put in the bounding box of the inclination image.

Table 1: Average values for geometrical shapes (hand drawn shape using paints)

Shape	Aspect ratio	Mean	Standard deviation
Circle	1	0.2286	0.3651
Rectangle	2.5417	0.2082	0.4963
Triangle	0.8864	0.2698	0.4538
Square	1	0.305	0.4717
Ellipse	1.8132	0.2386	0.4701

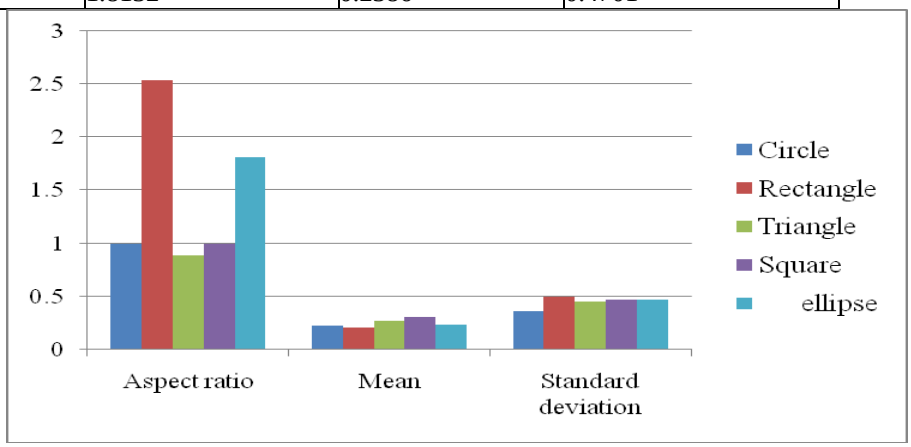


Figure 8: Bar graph values for geometrical shapes (Hand drawn shapes using paints)

Table 2: Average values for geometrical shapes (Digital camera)

Shape	Aspect ratio	Mean	Standard deviation
Circle	0.9791	0.3707	0.4901
Rectangle	1.9163	0.2519	0.4307
Triangle	0.8358	0.3529	0.4924
Square	1	0.2872	0.4599
Ellipse	1.7712	0.3262	0.4903

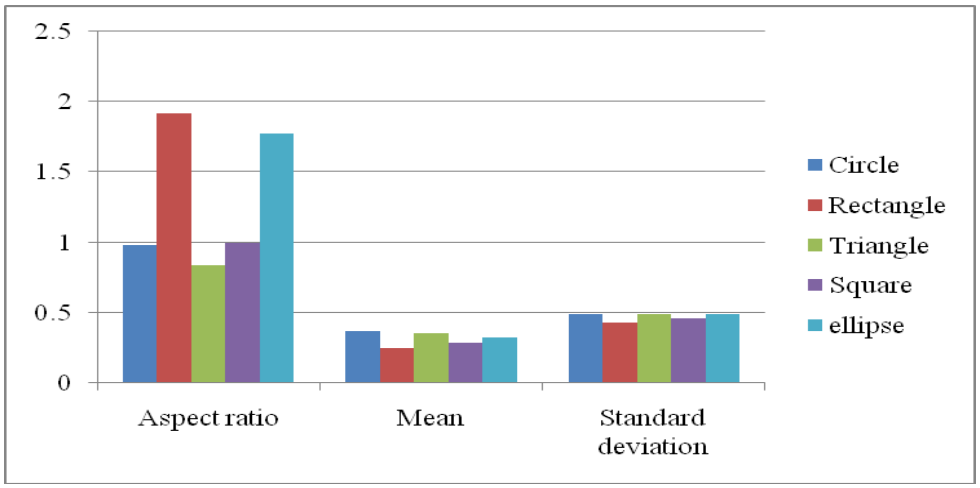


Figure 9: Bar graph for average values for geometrical shapes

Proposed method is tested on 220 data sets of different shape objects and gives 86.5% results. The datasets consist of images of the objects having the five shapes inclinations. Table 3 shows the results of the algorithm when run on each image separately. The images must be taken in hand drawn images using paints, and lit environment (be it natural or artificial lighting) and care must be taken to avoid shadows of the objects as much as possible.

Table 3: Results of test of algorithm on images from database

Shape of object	Number of correctly recognized/number of dataset	Percentage (%)
Rectangle	50/50	100
Circle	40/50	80
Square	35/40	87.5
Triangle	20/30	66
Ellipse	45/50	90

IV. CONCLUSION AND FUTURE WORK

Efficient shape detection using statistical feature based algorithm is developed and proposed in this paper. Statistical features like mean value, standard deviation, skewness, perimeter, diameter, length, height and aspect ratio. It computes the feature map for a different type of feature points and according to the feature map, the shape features are extracted. The process is entirely automatic and does not need user intervention. The proposed method is not domain-specific and does not impose limits on the variety of clustered sectional tree image. It can be used for all kinds of images provided that there is at least one or more meaningful shape features. A simple feature can not entirely represent the character of the shape. Therefore, multiple feature analysis is used in the proposed method. In our paper, we consider size, shape, inclination and color as the feature of the image. In order to improve the functionality and flexibility of the recognition system, statistical features can be combined together in future and further by increasing the number of images in the datasets, the recognition rate can be increased.

V. REFERENCES

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