2-D Geometric Shape Recognition Using Canny Edge Detection Technique

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***Abstract* - Objects are used in our everyday life.Ourenvironment is full of objects.Objects are classified based on their shapes such as spherical,rectangular,square,circleetc.We classify objects with the help of our senses but it is very difficult for a computer to classify as they don't have any senses.Therefore we have to program them in such a way so that they can classify or recognize different objects. In this paper, we will classify the shape of object that whether they belong to any geometric shape or not. We will recognize the shape of the objects from the black and white image, which was earlier a colored image .We will represent the image of an object with the help of Canny Edge Detection Technique.**

Keywords - Canny Edge Detection.Image Processing; Morphological algorithm; Object Shape Recognition

I. INTRODUCTION

Object recognition refers to recognizing definitive objects from an image.Learning,Comparing and pattern recogniztion is the main motive for object algorithm which adopts appearance and feature based method. The most accepted procedures which has been used are gradients,edges,Haar wavelets, Histogram of Oriented Gradients (HOG) and linear binary pattern matching. The advantageous applications for Object recognition such as, automated vehicle parking systems,videostabilization.There are diversity of models like boosted learning algorithms,Extracted features and, Bag-of-words models featuring SURF and MSER.There are some other accessing approaches for image segmentation which includesblobanalysis,Template matching ,Gradient-based and derivative-based matching approaches and Viola-Jones algorithm and After recognizing the objects, there shapes are being matched with the reference images. The pivotal problem of Shape matching is in case of visual information systems,computer vision, pattern recognition and robotics.The major utilization of shape matching includes inspection in industry, medical sciences, finger print matching and content based image retrieval.Pattern matching is an arrangement for modelling the pattern, and comparing their closeness with another pattern adopting the measure that shows dissimilarity in their behavior. The term Pattern matching and shape matching are frequently used reciprocally [1]. A suspicion of edge detection is defined. The search has two major aspects. (1) change in intensity, this happens as an image in ample range of scales, there are identified at particular scales. (2)surface discontinuities, reflectance or boundaries lead to intensity changes, and these discontinuities have the tact that they are localized spatially [2].The main goal of edge detection is to extremely decrease the amount of noise in an image, without effecting its structural properties which are in addition to be utilized in the image processing. An algorithm named as Canny Edge Detection Technique efforts by John F. Canny (JFC) in 1986.No doubt it is very aged , but this is most usable standard edge detection methods in research and design field.

Mathematical Morphology method utilizes the concept of symmetrical and individual architectural elements. These design elements are awared to image edge which has the similar direction of design elements in it.So,it is complicated to distinguish complex edge feature Mathematical Morphology is an impressive and capable tool for handling the complex problems in computer vision and image processing. Mathematical morphology is popularized as a method for investigating geometric architecture of geologic and metallic samples. This technique was continued to image analysis. [3]To overcome all the problems encounter in morphological edge Detection,we have chosen Canny Edge Detection Technique for 2-D geometric shape recognition.

The paper is described as follows: Firstly we have mentioned a review on the work done already in this area. Then, the methodology is explained.After that a clear description of all the techniques used in the proposed approach are mentioned.Then, we come to the future work which is yet to be done

II. LITERATURE REVIEW

Michael S.Lew et al [1].The authors proposed thatthe termTexture is utilized to categorize the facial surface of the provided object and it is definitely the very significant characteristics of image processing and also

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incaseidentification of patterns named as pattern recognition. It is considered as one of the optical characteristics that finds the segments, which exists in a particular class.If there is any kind of texture which helps in unique interpretation than it is stated as a natural texture.Otherwise, there may be a texture that may exists in a class which can be recognized by artificial optical features which consists of consists of concise mathematical interpretations.

D.Marr et al[2], the authors proposed that in case of Edgedetection, the investigation splits into two categories:1: (1) change in intensity, this happens as an image in ample range of scales, there are identified at particular scales. (2) surface discontinuities, reflectance or boundaries lead to intensity changes, and these discontinuities have the tact that they are localized spatially.In this intensity changes with illumination intensity.

SanketReige et al [4]., the authors described that the path foridentifying the 2-D shapes like squares,circles,rectangles& triangles and colors in geometric logic and DIP.The major techniques muddled in this is conversion 3-D RGB image.This algorithm is designed using MATLAB.There is an arrangement of ISO images involving four basic 2-D geometric shapes and the colors including red,green, blue is being used for investigating and achieving 99% accuracy in the results.

Bao.P et al [5],the author proposed that in the structure ofCanny edge detection,an approach for scale multiplication is evaluated.The product of the responses of the detection filter at two scales is known as scale multiplication function.By thresholding the scale multiplication outcomes,edge maps are designed as the local maxima . The identification and localization measure of the scale multiplication are found. The multiplication of the two measure for scale multiplication is larger than that for a single scale, which ultimately results in efficient edge detection performance.

ShalineePatil et al [6], the author proposed that theidentification of a location that recognize and catalog parts of a appropriate object class at the different levels of detail. Image Computer Analysis and Machine Vision has their foundations the image processing algorithms.The purpose of Object Detection system is to recognize the basic geometric shape of objects present in an image with the help of image processing algorithms that detects objects present in an image and then contrast those objects with the features of basic geometric shapes.This helps to categorize that which object is identical to specific geometric shape like circle, triangle, square and rectangle. The edge detection is performed by Edge Detection technique. Further it identify the objects using Canny Edge Detection technique. After this theseobjects are marked as the
region. And recognize the shape of that region,region properties are implemented on each region.

III. OBJECTIVES

- To recognize the shape of the object by applying Edge Detection Technique by John F.Canny by eliminating the use of heavy databases.
- To contrast the results with existing techniques

IV. METHODOLOGY

The Procedure followed is:

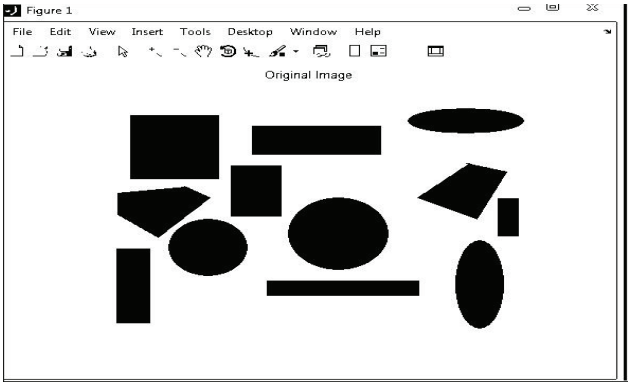

Fig. 1. Reading the image of shapes

The above figure shows the different shapes which has been used for the shape detection in this paper. This represents the Original Image having different shapes such as Circle, Square, Rectangle etc.

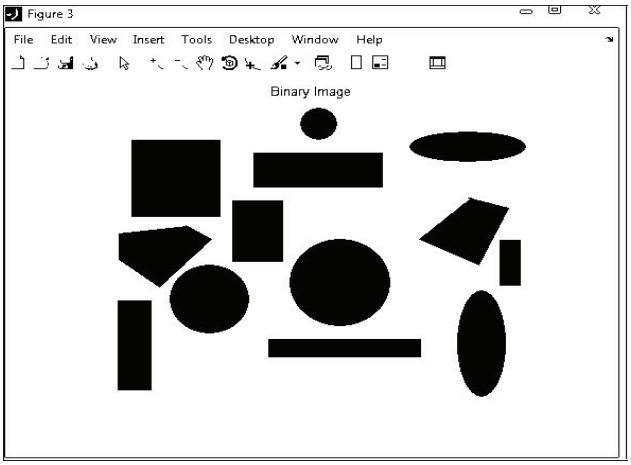

Fig. 2. Conversion of RGB image into black and white image.

The above image shows the binarized image. The binarized image is the image containing the pixel values of 1 and 0 only. The binary image is categorized as the 1-bit pixel based image. The black pixels are represented by 1 and 0 represents the while pxiels. By using this, the whole image converted into two colors i.e. Black and white. The whole background of the image will be

whiteand object appears in black color so we can easily detect the shape of the object.

- Diagnose the edges of an objects.

For recognizing the boundries of an image,the starting point is to set the single individual pixel on the object-background interface and finding the neighbouringpixels.The pixels may be found in either in 4-counted or 8-counted pixels.In this way object boundries can be identified.

- Compute the area of an object

The number of pixels in the boundary extent are summed up to compute the area of an object.

- Store the feature vector in database for a reference image.
- Invert the binary image.

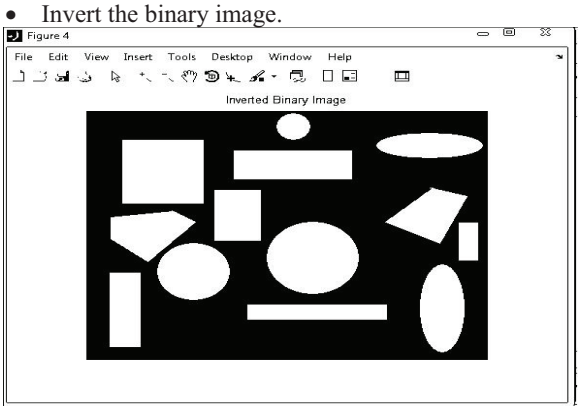

Fig. 3. Inverted Binary Image

Inverted binary image, as its name implies it is the inverse of previous binary image i.e the background is converted into black color and the different shapes into white one. This is used to verify the exact shape of a particular object.

- Shape detected in figure window.

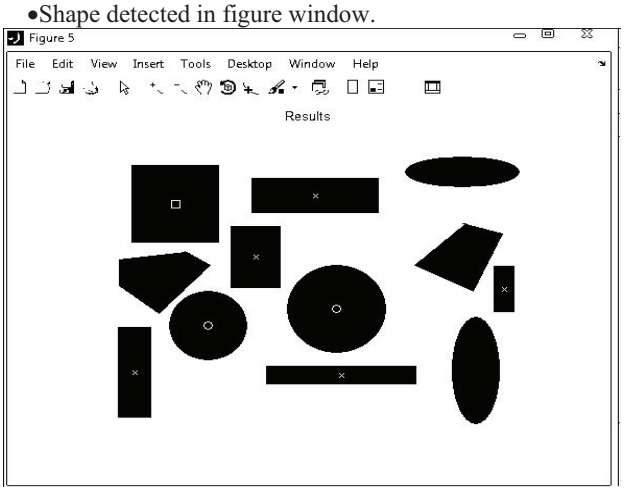

Fig. 4. Detection of shapes in the binary image

In this image, the shapes mentioned in the project code are identified and marked inside the recognized shape and the rest one are not recognized.

A. Edge Detection

The motive of edge detection is analyzing the points in an image,at which the lightness of an image switches clearly or orderly,contains some discontinuance.The areas of an image where its brightness switches orderly or sharply are customarily standardized into a fixed set of edges,represented as curved lines. This problem of searching discontinuities also occurs in ID signs which is stated as step detection. Same as searching signal discontinued on the time parameters is stated as change detection. In the field of feature detection & feature extraction,edge detection is considered to be very advantageous tool in image processing, computer vision and machine vision as well.

The main goal of edge detection is to extremely decrease the amount of noise in an image, without effecting its structural properties which are in addition to be utilized in the image processing. An algorithm named as Canny Edge Detection Technique efforts by John F. Canny (JFC) in 1986.. Edge detection is one of the important pre-processing steps in image analysis. Boundaries are characterized by edges and image processing, detecting an edge is the most complex step to be performed. In images Edges corresponds to the regions having strong intensity converse and change in intensity from one pixel to the other can cause vital change in the Fquality of picture. Detecting an edge of an image van greatly decrease the amount of data and filters out unwanted information, while keeping the important architectural characteristics in an image [3].

B. Canny Edge Detection

The scientist named as John F Canny,has developed an edge detection technique named as Canny Edge Detection in which John Canny Edge Detection,in which John Canny has advised the solution of the mathematical complication of collecting a smoothing filter accustomed,the standard of localization,detection & reducing numerous feedbacks to a particular single edge. John Canny revealed that the optimal filter disposed these beliefs in a comb of four exponential provisions.

Optimal edge detector is the other brand name for Canny Edge Detection technique. The main motive of John F Canny's is to increasethe multiple numbers of edge detectors in the image.

Firstly:It should focus on little error rate and filtering own essential information, whereas the useful information is conserved.

Secondly: It should keep the maximum little amount of variation achievable between the processed image and the original image.

On the basis of these three principles, with the help of Canny Edge Detector, the noise is eliminated by smoothing an

Then the gradients in the image are found and focus on the areas with huge spatial derivatives.

V. RESULT

TABLE I. THE ACCURACY OF SHAPE DETECTION IS SHOWN BELOW

Type of Object	No. of shapes	No. of accurately detected shapes
Circle	3	**3**
Square/Rectangle	**6**	**6**
Oval	**2**	**0**
Polygon	**2**	**0**

From this experiments, it is observed that Canny Edge Detection Technique has achieved the shape recognition purpose. In case of simple images with a little texture inside, the result is quite good, and this method also performs well on mathematical objects placed inside a particular image. The implementation of Canny edge technique yields the following final result:

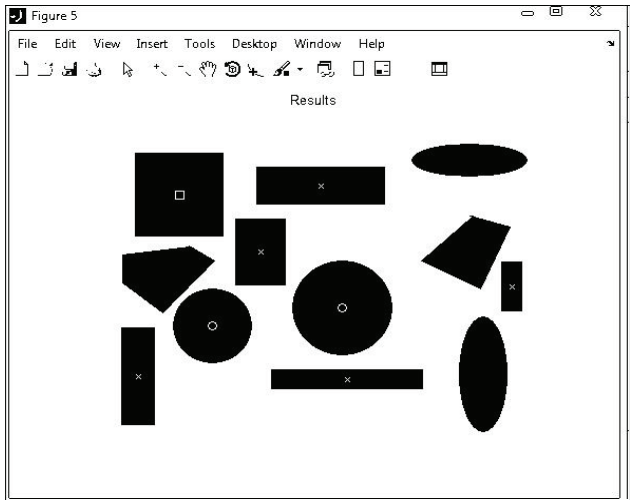

Fig. 5. The result of detection of shapes

In this image, the shapes mentioned in the project code are identified and marked inside the recognized shape and the rest one are not recognize.

VI. FUTURE SCOPE

In this paper, we propose an approach for recognizing the shapes of objects with the help of canny edge detection technique.To recognize an object from an image is a very problematic task. There is one clarified method to solve this complex task is to convert the grey scale image into a black and white image i.e binary image. Binary image consists of two pixel values i.e either 1 or 0. The approach utilized in cse of binary images are morphological image processing,blob analysis and connectivity analysis.

The future work will be that there should not be any reference, the work of detecting and matching the image in the database will be eliminated, and the detected image will be automatically represented as it is and the operations are performed on it to achieve the desired results. This will be done with the help of canny detection technique. It will also eliminate the load of managing heavy database. Simple recognition of image will be done with the help of this technique.

In the future, the geometrical shape recognition method can be also utilized for the object detection for the image processing practices like object based image forgery detection, apple detection, etc. The robust feature description can be hybridized along with the 2-D object shape detection to produce the expert object evaluation service.

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