2D IMAGE PROCESSING FOR DELTA PARALLEL MANIPULATOR ROBOT

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***Abstract*— The paper discusses an approach involving 2D digital image processing and geometric logic for recognition of two dimensional shapes as well as the color of the object. The goal of Basic 2D Object Detection system is to identify the basic geometric shape and color of objects present in image.**

Then it recognizes the boundaries of the object. Calculate the area of each object which is going on the conveyer belt. Then locate the X-Y co-ordinate of that image. The methods used are color pixel classification, area based filtering and used of bounding box and its properties for calculating object matrices. The object matrices are compared with predetermined values that are characteristics of a particular object. Filter out objects below an area threshold of that image. The shape and color recognition of the image result is 99% accurate. This is the industrial automation for the shape and color recognition used in robotics with the help of digital image processing.

***Keywords*- MATLAB, Bounding box, X-Y co-ordinates, Shape recognition, Color recognition**.

I. INTRODUCTION

In today's highly advanced and automated industries, various techniques are available to detect geometric shape and color of a particular object. There was a time when revolutionized research has been done and further advance techniques had been implemented in delta robot.
The sensors play an important role in presenting information related to the parameters in a running process. Temperature, light, percentage composition, humidity, structure shape, dents etc. are the many examples of parameters that sensors can detect.

Highly precise sensors are used in industries to provide better feedback to controllers. For example, the more the precision of the sensors, the more is the ability of the sensor to detect faults. The field of digital image processing has found many applications in the field of automation. Sensors like cameras acquire live video feed or image of the objects moving on the conveyer belt. The video or image is then used to recognize the object, or in some cases, compare the object with a predefined, flawless and expected object and a decision is made based on the degree of similarity between the two images. A controller controlling a robotic arm then either allows the qualified object to pass or picks and places the unqualified object into the rejected bin.

II. LITERATURE SURVEY

A number of shape recognition and color sensing algorithms have been proposed in the past. A detailed survey of color sense algorithms can be found in [1] and object recognition algorithms can be found in [2],[3].object recognition can be done in two ways: 1) Comparing every pixel in the image to the pixels of a number of other images stored in the processor's memory [4], [5], and 2) Extracting information from the image, calculating certain metrics based on this information and comparing the values of these metrics to predetermined values [6]. The first method is commonly used in applications like fingerprint recognition where a large database of fingerprint or facial image samples is maintained in image form. This process is, as expected, memory intensive as well as time consuming for obvious reasons. The second method, on the other hand, is useful when there are limitations on memory as well as time required to process data and produce results.

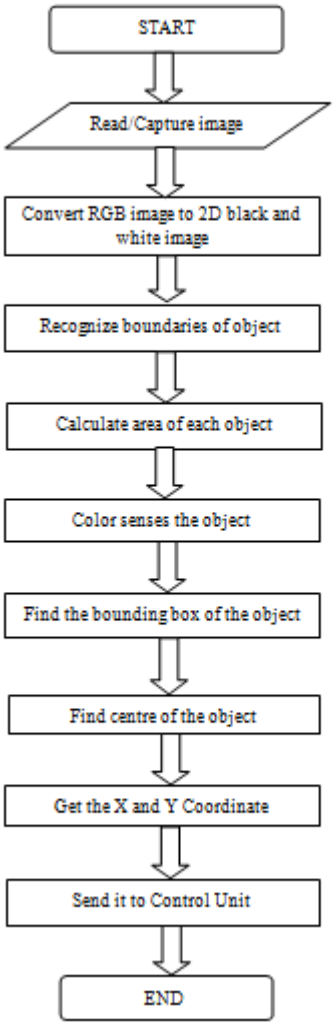

Fig.1 Flowchart showing the various steps of processing

I. ALGORITHM

A. START

At the starting of the process clear all the data from workspace and the command window gathering the required data from the MATLAB. For capturing the image we have used high quality webcam having high resolution (640*480) .Feeding the algorithm in MATLAB the process begins and the live video starts.

B. READ/CAPTURE IMAGE

The image is first acquired from a live video feed or an existing image can be loaded from a current directory considering the acquired image is in RGB format which is a true color format for an image [7], [8]. In MATLAB, the captured or imported RGB image is three dimensional whose pixel size corresponds to the size of the image.

C. CONVERTING RGB IMAGE TO BLACK AND WHITE

Converting our gray scale image to Black and White image with respect to level. The grayscale image is nothing but a matrix which represents the pixel of an image. The process of thresholding converts RGB image to black and white image with respect to each pixel.

Fig.2 Original RGB Image showing a red rectangle

Fig.3 RGB image converted to Gray-scale image.

D. RECOGNIZE BOUNDARIES OF OBJECTS

The image is now a two dimensional black and white image. Boundaries of the objects are detected by first setting a single pixel on the object .The starting point is set along background interface and moving in a clockwise or counterclockwise direction. The pixels of an image can be searched either diagonally (in 8-connected pixels) or edge-adjacent pixels (in 4-connected pixels). By hunting for object pixels in a fixed direction, the object's boundary can be recognized explained in F. Meyer's, "Color image segmentation".

E. FINDING AREAS OF OBJECTS AND AREA FILTERING

Once the object boundaries have been recognized, the area of that object is detected and can be easily be calculated by summing the number of pixels within the boundary limit.

The object corresponds to noisy level which may be treated as an object pixels which has to be removed for further processing of an image .If else the object area is below the threshold value can be converted into background pixels (i.e., they can be inverted). In this way the image is filtered to remove small, isolated noise pixels.

F. COLOR RECOGNITION OF AN OBJECT

The object may be classified according to their colors. For example the recognition of red color can be done by tracking red objects in real time and then subtracts the red component from the grayscale image to extract the red components in the image. The same process is repeated for both green and blue color.

G. FINDING BOUNDING BOX OF THE OBJECT

It is an imaginary rectangle that completely encloses the given object and its sides are always parallel to the axes. Due to the various angles of inclination of an object, the dimensions of the bounding box change accordingly. The shape of an object should be constant to make the shape recognition independent of an object .For classification of an object bounding box is an important parameter.

H. FIND CENTRE OF THE OBJECT

After determine the imaginary rectangle of an object the centroid can be located with respects to the axes of an image.

I. GET THE X AND Y COORDINATE

The co-ordinates of an image are determined after locating the centroid of an image.

J.SEND IT TO CONTROL UNIT

In MATLAB, X and Y co-ordinates are generated and these can be transferred to the micro controller unit. For this interface between computer and controller is necessary and it can be done using USB, parallel and serial ports.

II. RESULT

From the algorithm we have generated the codes for different colors i.e. (blue, green, red).After analyzing the code in MATLAB we conclude that for recognition of different colored object is possible by changing the wavelength of colors. By repeating the process for multiple times the result for red and blue is correct but for green the error is generated. Hence our result is 99% accurate.

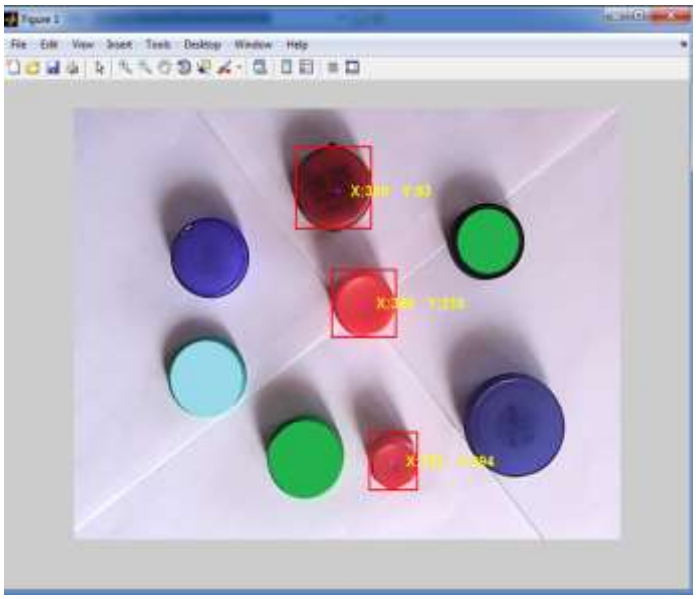

Fig.4 Red colored object recognition

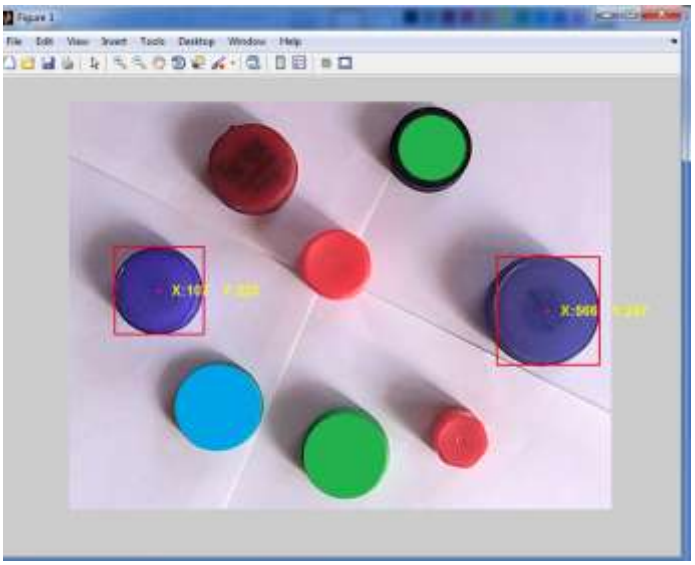

Fig. 5 Blue Colored Object Recognition

III. CONCLUSION

From these programs conclusion is that the codes generated for red, blue, green can be use for delta parallel manipulator robot in industrial automation. For sorting of specific object the required object is selected and faulty or unwanted object are ignored from the conveyor belt and its results are further displayed on LCD screen.

IV. REFERENCES

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