

RESEARCH ARTICLE



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## TARGET DETECTION, RECOGNITION AND DESTROYER USING COLOR ENHANCEMENT

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### ABSTRACT

This paper illustrates the application of Target detection, recognition and Destroyer using Subtraction algorithms and color enhancement technique to find the target and its position in video frame and then destroy it using laser beam. It is one type of robot which could be used for many application like defense, industrial and mining workstation. It uses MATLAB r2012b as simulation tool for this application.

**Keywords**-Color detection, recognition, Image, object.

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### INTRODUCTION

In this paper we are going to detect[3] and recognize[4] the specific object like car, tennis ball, pen and some simple object. It is one type of robot[8] on which camera is attached which is rotating 360 degree and robot[8] is also movable. When we start the robot[8] then it start to find target which is preprogrammed by user. Here target is set by user which is movable[11] or stationary, we chose one red robotic car as target.

For implementing this Application we used subsequent frame subtraction and color enhancement along with basic manual thresholding method which detects[11] the color of the object converts it into binary image, like required part in the image into white portion and unwanted portion into black color, which gives the complete binary image.

This robot is very useful in many application by making a small change so it provides better flexibility, plus the code is used for this application is optimized compressed code and very easy to understandable to non-technical person also.

For the varifying result we have used the sound processing technique which generate the speech signal that "Object is recognized in the Image" when Object recognized in the image, and "Object is not recognized in this image" when object is not recognized in image.

This project is used for Industrial application, in Defense, for mining application and aeronautical application, mining workstation personal use etc.

### MATLAB PLATFORM

For this application we take sequence of frames by camera attached on it and then applying our main logic subsequent frame subtraction and color enhancement technique on the video frames coming from camera. Steps after this is given below with commands used for it.

#### A. Color image to B&W conversion

Here we are used image processing for this project. MATLAB r2012b is a software tool for doing image processing, we are using command 'videoreader ('car.3gp)' for read the image or frame, and after that we generate the binary image of original image. Binary image is the conversion of original image to

black and white image, here the value of black pixel 0 and value of white pixel is 1.

After conversion of color image to black and white image, portion of our required object is displayed as white area and other portion of image is displayed as black, we can see this by using another command 'imshow(image\_bw)'.

#### B. Detection of white area

Next we detect the required white area which is our object by using function 'REGIONPROPS' [3][4].

REGIONPROPS: Measure the properties of any particular image region. Of properties for each connected component (object) in the binary image BW, which must be a logical array, it can have any dimension. STATS are an array of structures with length equal to the number of objects in BW, CC.NumObjects, or max (L (:)). The fields of the structure array denote different properties for each region, as specified by PROPERTIES. PROPERTIES can be a comma-separated list of strings; a cell array containing strings; the string 'all'; or the string 'basic'.

In this project mainly one shape measuring function is used, that is area by using this it gives area of detected portion in image, and puts rectangle on it.

#### C. Confirm the Object

In this module we confirm that recognized object in video frame is our required object[11] or not, this is done by using implementing simple mathematical logic function that takes the ratio of height and width of object compare it with the appropriate range of predefined ratio which is taken by analyzing object which is done by using command 'imtool(img)'.

#### D. Result

We have used sound processing for produce the result, it will generate the speech the signal that 'Object is recognized in this image' and 'Object is not recognized in this image' this can be done by using 'audioread' & 'audioplayer' function in switch on laser beam on target as shown in fig.

#### METHODOLOGY

Method that we used in this is mainly divides into three part.

#### SUBSEQUENT FRAME SUBTRACTION

It is the main method used to detect the target in the video frame. In this method we subtracts two subsequent frame to get target and for Background subtraction[3], which is also known as the background subtraction.

$$I\_diff=I1-I2..... (1)$$

Here I\_diff is the difference of the two subsequent frame, I1 is the first frame coming by camera where I2 is the following frame after the I1. So it gives object by eliminating background[3] step after this is given below.

Here we used the thresholding with the subtraction to get more accuracy in result. Various Steps used to get result by this method is given below.

Here we first we obtain the difference of the two subsequent frame and then applied the following step.

#### A. Color detection

In this part we have used the simple manual thresholding which detects the color of our interest like if we require red then simply  $img(:, :, 1) > 50$ ; which detects the red, here we do thresholding by analyzing the color profile of object, this can be done by the command which display the complete color profile of image, from which we can find the range of values that is used in thresholding.

#### B. Area calculation

Here we calculate the area of detected portion in binary image, which calculates the area of white portion and place the rectangle on detected object. Again we calculate area by using logic we calculate the appropriate area by finding height and width of object from the binary image.

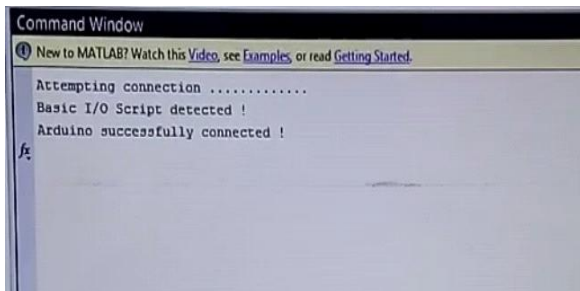
Here we have used REGIONPROPS function for finding automatic area and placing rectangle. For finding manually area we converts the binary image into single row matrix and finds its maximum value which is the height and now by inverting this single row matrix again finds the maximum value of it which is the width now by multiplying height and width it gives the appropriate area.

#### C. Comparison and position recognition

In this part we have used the simple comparing algorithm which compares the both value of area

obtained before then if the area is matched appropriately then it recognizes the Object otherwise it gives false result of recognition[4]. Hence recognition algorithm implemented easily by using features area and color of object. Next we recognize[7]it's position and fit into center of video frame and destroy the object by turning laser on.

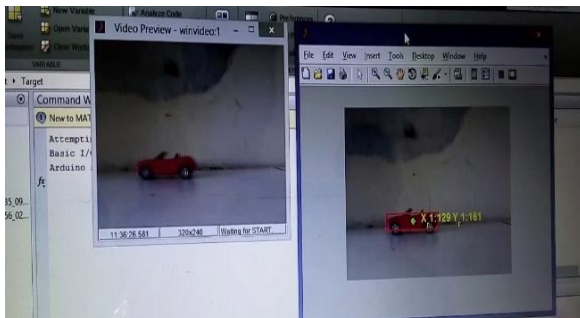
**RESULT**



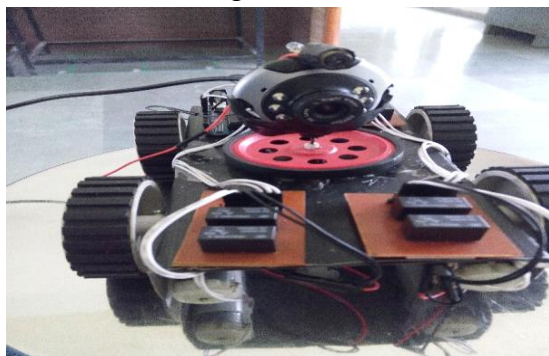
**Fig. Attempting connection**



**Fig. Target recognized**



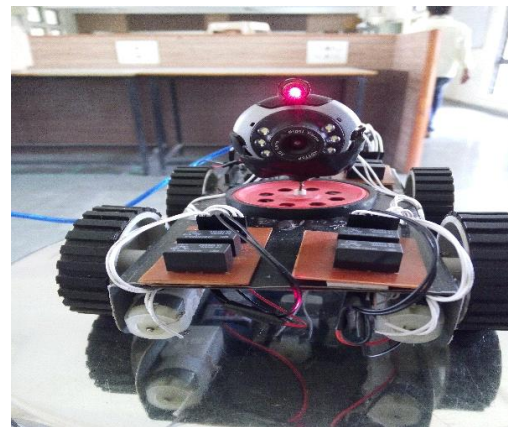
**Fig. Preview**



**Fig. Robot**



**Fig. Laser beam**



**Fig. Robot with laser on**



**Fig(1)**

**Fig(2)**



**Fig(3)**

**Fig(4)**



Fig(5) Fig(6)



Fig(7) Fig(8)



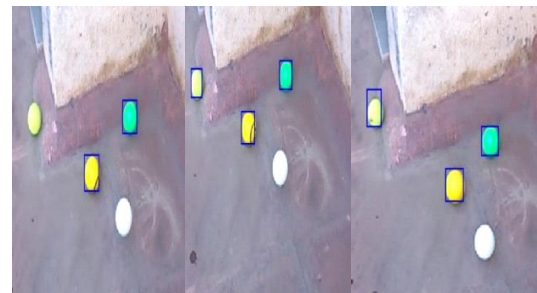
Fig(9) Fig(10)



Fig(11) Fig(12)



Fig(13)fr.1 Fig(14)fr.25 Fig(15)fr.50



Fig(16)fr.1 Fig(17)fr.25 Fig(18)fr.50



Fig(19)fr.1 Fig(20)fr.25 Fig(21)fr.50

Here the fig 1, 2 recognizes the pink ball at one level of Intensity, fig 3, 4 recognizes the pink ball in intensity level 2. Fig 5, 6 recognizes the pink ball in intensity level 3. Fig 7, 8 recognizes the pink ball in intensity level 4 so it eliminates the problem of intensity variation. Fig 9 recognizes the green ball, fig 10 recognizes the cell phone, fig11, 12 recognizes the ball pen

Fig 13, 14, 15 recognizes the White ball in different frame, fig 16, 17, 18 recognizes the multiple ball in different frame and fig19, 20, 21 recognizes the toy car in different frame.

Equations:

$$\text{Precision} = \frac{\text{Correct}}{(\text{Correct} + \text{False Position})} \dots \dots \dots (A)$$

$$\text{Recall} = \frac{\text{Correct}}{(\text{Correct} + \text{Missed})} \dots \dots \dots (B)$$

$$F1 = \frac{(2 * \text{Recall} * \text{Precision})}{(\text{Recall} + \text{Precision})} \dots \dots \dots (C)$$

Equation A gives the precision value for result, Recall value for result is given by equation B and F1 gives the final result Table1.1 gives recall, precision and F1 for images and table 1.2 gives recall , precision and F1 for video frames.

Table1.1

| Objects                        | No of Images taken | Object Detected | Object Recognized | Correct | Missed | False position | Recall | Precision | F1   |
|--------------------------------|--------------------|-----------------|-------------------|---------|--------|----------------|--------|-----------|------|
| Ball                           | 10                 | 1               | Pink ball         | 9       | 1      | 0              | 1      | 0.9       | 0.94 |
| Ball(two)                      | 10                 | 2               | Tennis ball       | 7       | 3      | 0              | 1      | 0.7       | 0.82 |
| Ball(three)                    | 10                 | 3               | Pink ball         | 7       | 3      | 3              | 0.7    | 0.7       | 0.70 |
| Pen, ball, cell phone, toy car | 10                 | 3               | Ball pen          | 6       | 4      | 4              | 0.6    | 0.6       | 0.60 |

Table1.2

| Objects        | No of video frame taken | Object Detected | Object Recognized | Correct | Missed | False position | Recall | Precision | F1   |
|----------------|-------------------------|-----------------|-------------------|---------|--------|----------------|--------|-----------|------|
| Ball           | 50                      | 1               | White ball        | 50      | 0      | 0              | 1      | 1         | 1    |
| Ball(multiple) | 50                      | 3               | Multiple ball     | 41      | 9      | 7              | 0.82   | 0.85      | 0.86 |
| Toy car        | 50                      | 1               | Toy car           | 50      | 0      | 0              | 1      | 1         | 1    |

**CONCLUSION**

This robot is to detect and recognize the target and destroy it using laser by simplest technique subsequent frame subtraction and colour enhancement in image processing. It gives accurate result in very less coding and provide better flexibility for change the target object by minor change. It is easy to use and very simple to understand. It gives 80% result when we use maximum three and when we use more than three object it gives 60-70% result. When we use real time video camera and perform on video frame than it gives 85% result up three object and when we use only one(single) target than it gives 100% result.

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