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Red Green Blue (RGB) Colour Detection Using MATLAB

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Abstract

This paper demonstrates a method to detect live coloured Red, Green, and Blue (RGB) images or objects using camera and MATLAB program. If any RGB (Red, Green, and Blue) coloured image or object comes in front of the camera, it detects a particular colour. This concept uses Image processing as its basic principle. The camera places a rectangular box over the image which will show the presence of particular colour at that enclosed space. This concept can be used in many applications like colour–object finder and colour-detector robot. MATLAB allows us to create a Graphical User Interface and we can perform the colour detection operation of RGB (Red, Green, and Blue) colours by using a program and image processing technique helps us to convert an image into digital form and performing operations on it to get an enhanced image or to extract some useful information as in this to detect RGB (Red, Green, and Blue) colours.

Keywords: *MATLAB, Camera, Image Processing, Grey Scale Image, GUI, Median Filtering, Color detection, , Binary Scale Image*

I. INTRODUCTION

Many Many real-world applications like motion detection, object detection, colour detection require real-time image processing. In this paper, a method has presented to detect the live coloured images or objects using a camera (inbuilt 0.3 megapixels) and MATLAB program. If any RGB (Red, Green, and Blue) colour comes in front of the camera, it detects a particular colour depending on the user's command. The program can be written and in any version of the MATLAB, here 2013a version has been used. Similarly, any camera can be used as per our requirements, here initially; a built-in webcam of 0.3 megapixel of laptop has been used. The various tools and concepts used in the process of color detection have been discussed in the next sections.

II. MATLAB- A PRODUCT OF MATHWORKS

MATLAB is a commercial software product available from The Math Works. It consists of a main "engine" to perform computations, and several (optional) extended - function libraries (called "toolboxes") for special - purpose applications. MATLAB has a rich set of constructs for plotting scientific graphs from raw or computed data, suitable for inclusion in reports and other documents [1]. Assistance for commands may be obtained by typing help on the command line, followed by the specific keyword. For example, in using the "disp" command to display text, typing help "disp" shows the syntax of the command, together with a brief explanation of its operation. MATLAB files have an ".m" extension. Two useful commands are clear all and close all, which clear

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all current variables, and close all display windows respectively [2].

III. GUI (GRAPHICAL USER INTERFACE)

A GUI (Graphical User Interface) is a system of interactive visual components for computer software. GUI objects include icons, cursors, and buttons. These graphical elements are sometimes enhanced with sounds or visual effects like transparency and drop shadows [3, 4]. Unlike a command-line operating system or CUI (Character User Interface), like UNIX or MS-DOS.GUI operating systems are much easier to learn and use because commands do not need to be memorized [3, 4]. Additionally, users do not need to know any programming languages. Because of their ease of use and more modern appearance, GUI operating systems have come to dominate today's market. A pointing device such as the mouse is used to interact with nearly all aspects of the GUI (Graphical User Interface). More modern devices also utilize a touch screen. However, it is also possible to navigate a GUI using a keyboard [3]. Now suppose if anyone wants to detect the RGB (Red, Green and Blue) colours, then firstly the program will be run [5]. If the colours are present as well as more than the preset luminance value, (here 0.18) then the colours will be detected and enclosed in the rectangular boxes with the '+' symbol. Red, Green, and Blue colours will be enclosed in green and blue rectangular boxes respectively.

IV. IMAGE PROCESSING

Image processing is a method to perform some operations on an image to get an enhanced image or to extract some useful information from it [6]. It is a type of signal processing in which input is an image and output may be image or characteristics or features associated with that image. Image processing basically includes the following three steps-: Importing the image via image acquisition tools, Analysing and manipulating the image and output in which result can be altered image or report that is based on image analysis.There are two types of methods used for image processing namely, analog and digital image processing [7, 8, 9]. Analog image processing can be used for the hard copies like printouts and photographs. Image analysts use various fundamentals of interpretation while using these visual techniques. Digital image processing techniques help in manipulation of the digital images by using computers [10]. The three general phases of all the types of data have to undergo while using digital techniques are preprocessing, enhancement and display (information extraction) [11]. Median filtering has also been employed here. It is a non-linear digital filtering technique used to remove noise from an image or signal. Such noise reduction is a typical pre-processing step to improve the results of later processing [11]. It is very widely used in digital image processing because under certain conditions it preserves edges while removing the noise. It is more effective than convolution [11]. In this the image processing is employed by firstly capturing the image then the operations are being performed such as obtaining a grey image, removing color components, removing noise from the grey image by using filter command converting the filtered image into a binary image and finally placing rectangular box along with '+' symbol showing the coloured area or region.

V. PROGRAMMING METHODOLOGY FOR COLOR DETECTION

The following steps (syntax) in the programming help to achieve the goal of live colour detection of RGB (Red, Green, and Blue) colors using MATLAB [12, 5]. The images had been shown after executions of these syntaxes for the red colour object which is stated sequentially. These syntax executions have been performed in the MATLAB 2013a platform.

a.) d=getsnapshot (v) → this function returns an image from the video input.

The image returned is shown in the Fig. 1 given below-:

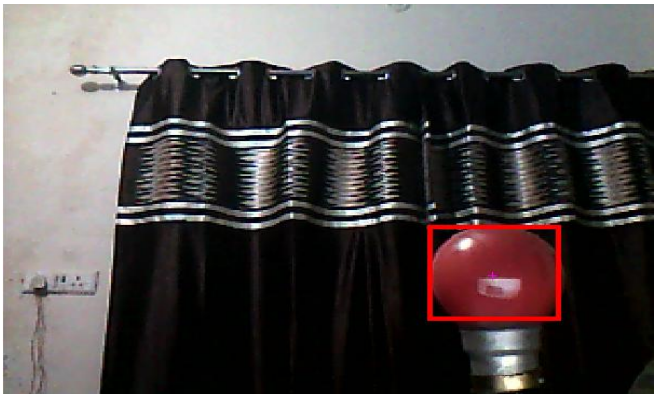

Fig.1: Snapshot image of the red-colored object

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The next process is the conversion of colored image to grayscale image [13].
b.) rgb2gray (d)→ it converts the colour image to grayscale image.
The image returned after executing this function is shown in the Fig. 2 given below-:

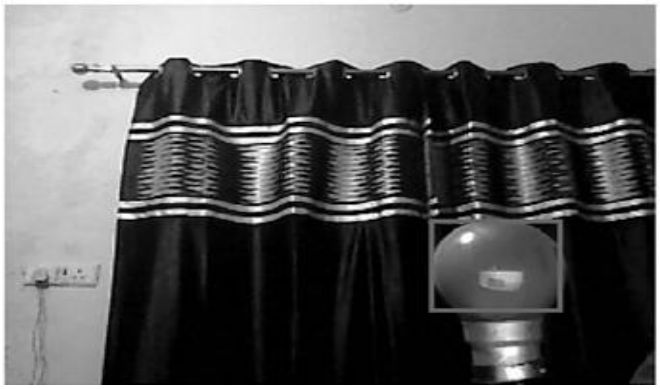

Fig. 2: Greyscale image of the coloured image

After obtaining the greyscale image, next, the red components have been substracted from gray image
c.) diff_im = imsubtract (d (:,:,1), rgb2gray(d));→it is used to subtract red components from grey image.
imsubtract(d(:,:,2), imsubtract(d(:,:,3)are used to subtract the green and blue colours from the grey image respectively.
Fig. 3 given below shows the image obtained for the snapshot image in figure 1.

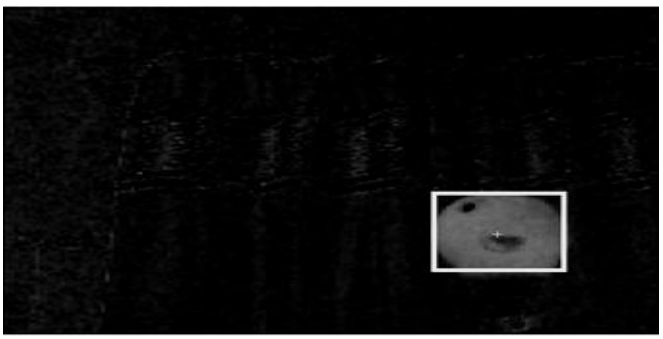

Fig. 3: Image obtained after subtracting red colour component from grey image.

Once the substractioon process is over, then the next work is to remove noise from that grey image.

d.) medfilt2 (diff_im, [3 3])→ It is used to remove noise.
Median filtering is a nonlinear operation used in image processing to reduce salt and pepper noise [11].

e.)a=im2bw (a, 0.18)→ it converts the greyscale image to a binary image.
The output image "a" replaces the pixels in the input image with luminance greater than the preset value (here 0.18) with one (white) and the other pixels with value zero (black) [14]. Figure 4 given below shows the binary image obtained as output.

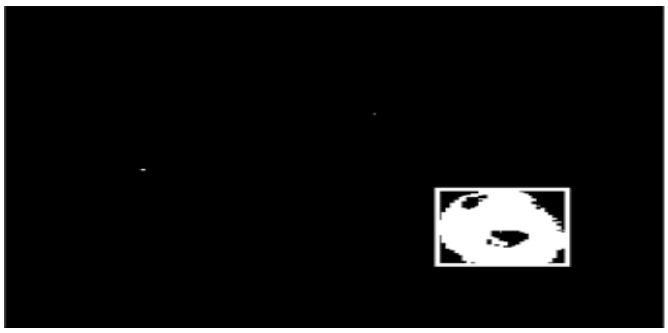

Fig. 4: Binary image of the red-colored object

f.) stats = regionprops (a,'BoundingBox', 'Centroid') -> it measure a set of properties for each component in binary image

VI. RESULT AND DISCUSSION

The RGB (Red, Green, and Blue) colours had been detected as shown in figure 5 given below. The red, green, and blue colours are detected and enclosed in a rectangular box with their respective colours. Objects are detected only when the luminence is greater than the preset value. Here the preset value is 0.18 which can be changed as per one's requirements and choices. On changing the preset value, the outputs for the binary image changes as well.

Fig. 5: RGB detection of different objects using inbuilt laptop camera

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VII. CONCLUSION

The object detection has many utilities in industries such as colour object detector which can be used in industries to detect and place the different coloured objects and many other applications. It is helpful in the industries or places which deal with different objects with different colours such as in the fruit industry where different fruits have different colours and they can be distinguished and separated easily saving time and labour. It is also helpful in the places where the bulk material is received and there comes a need to distinguish the different products based on the colours.

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