Real-time Automated Guidance System to detect and Label Color for Color Blind People using Raspberry Pi

K. Dheeraj[1], Dr.S.A.K.Jilani[2], Mr.S.JaveedHussain[3]
Student (M.Tech in Micro and Nano Electronics), Madanapalle, India[1]
Professor, Department of Electronics & Communication Engineering, MITS, Madanapalle, India[2]
Associate Professor, Department of Electronics& Communication Engineering, MITS, Madanapalle, India[3]

Abstract

Color blindness is commonly known as color vision deficiency, the vision defect which presented in our eye ball recognition of color is the major problem for the people who are having color blindness. In this work, we are proposing a hand held real-time automated guidance system to detect and label the color name for color blind persons that will help to identify and label color which they can't do using natural eyes. We designed this Real-time application using Matlab Simulink model. This Paper mainly focusing and developing the users interface it can detect the color and label the color name which is shown by using video glasses. This system mainly consists of computer, raspberry pi B, camera module, and video glasses.

Keywords - *Color blindness, camera module, color detection and labeling, and raspberry pi camera.*

I. INTRODUCTION

The color vision deficiency (CVD) is known as visual weakness is the kind of vision deserted in our eye ball. The greater part of the individuals experiencing shading vision shortage they can see types yet difficult to separate between red, green, blue and yellow hues. Is not totally visual deficiency it is a gentle handicap to recognize certain hues in their everyday life and it causes real issue in now a days.

As indicated by the review for each 10 individuals 1 is having the shading location issue. Photoreceptor cells which are displayed in our retina are described as sensitive to light.Protonopia which does not see red light and deuteronopia can't see green light and persons experiencing this kind of lack can't recognize red and green.

Achromatopsia is absolute visual deficiency the persons suffering over this can just see dark, white and grayish hues and having lazy eyes, not able to distinguish in bright light.This happens by poor working of rods and cones in our eyes.it is not appealing it is genetic problem, it can't be spread.

Challenge building and shading coordinating is troublesome undertaking for visually challenged persons. To conquer this we Composed and built up a gadget and programming interface is utilized to help for color blind persons.

Color vision deficiency (CVD) is commonly known as color blind is a type of vision defect in our eyeball. It is caused by the defecation in our eyeball which is either the defects or completely missing of certain photoreceptors. As a result, color with certain spectrum is unable to be detected by the photoreceptors causing the color of the image saw with the eyes is different from the real color. For instance, a red object might appear as yellow for red-green color blind people.

There are two different types of photoreceptors in our eyeballs that allow us to see everything. They are called rods and cones. The rods receptors are very sensitive to low light level but not to color while cones are sensitive to colors.

There are three types of color blindness that is monochromatism, dichromatism and anomalous thricomatism. . Monochromatism is either the absence of cones or only one type of them in the eyes. A person with this type of colorblind is very rare and his/her vision is equivalent of a black-and-white movie.

In the human retina we have four photoreceptors three are red, green and blue the other is rod photoreceptor which don't distinguish shading. The cone comprises of three wave lengths they are red or L cone (long wavelength), green or M cone (medium wavelength), and blue or S cone (short wavelength).

II. LITRATURE SURVEY

Detection of color has been widely used in many fields. We have observed about detection of color on arduino, microprocessors as well as in raspberry pi.

V. Sathish Kumar, Gopal Krishnan, G. Senthil Kumar, proposed "Embedded Image capturing system" using Raspberry Pi[1]. B.S.Sari, Ananto, B.S. Sari, R.F.; Harwahyu, R. proposed a system for color blind persons "Color blind compensation on augmented reality system". In this we can observe the transformation of color[2]. K. Kobayashi, T. Ohkubo designed a system for color blind persons " A Color Compensation vision system for color-blind people"[3]. Hogness DS, Nathans J, Thomas D developed a system of molecular genetics of human color vision: The genes encoding Blue, Green and red colors [4]. The simulation I present here is very basic and should be extended to handle some real time applications like labeling the specified color. I've done this in my application and added to Simulink block. This allows me to make a simple wok done to label the color using Raspberry Pi.

III. SYSTEM DESIGN

The suggested work is Real-time colordetection and labelling of an object by using Raspberry pi B, video glasses, and Raspberry pi camera. The impartial of this researchis to categorise the color of an object frame and to compatibly label out the color. Initially camera is utilized for object capturing, then colors are identified with the algorithms of image processing along labelling of colors. Similarly it captures the primary colors (RGB), therefore it compares object color with primarycolorsand notice the color of an object for eachcolorthe programwritten in the software application.Operation of the proposed system is done intwo steps.

A. Hardware Design

The hardware system consists of raspberry pi model B, raspberrypi camera, virtual display glasses, and power supply cables. Fig 1 showing proposed system

1) Raspberry pi Mode B

The raspberry pi model B acts as smaller than usual processor and little measured circuit board. Which is centered on a Broadcom "BCM2835" System onchip which includes ARM1176JZFyS 700 MHz processor, initially with 512MB RAM.A SD card is used for booting and for long term storing instead of built in hard disk, with audio, feature, HDMI, Ethernet and USB ports. It is Linux based working framework and is put away in the memory card, python is default programming dialect in raspberrypi Java, C, C++ dialects can likewise be introduced and utilization programs in the framework.

The aim was to rekindle the micro-computer revolution from the 1980s, which produced a whole generation of skilled programmers. The name, Raspberry Pi, was the combination of the desire to create an alternative fruit-based computer (such as Apple, BlackBerry, and Apricot) and a nod to the original concept of a simple computer that can be programmed using MATLAB (shortened to Pi).

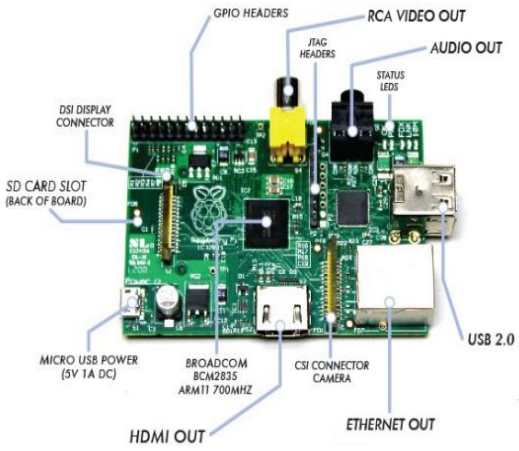

Figure 1: Raspberry Pi model B

2) Power Supply

Easily we can give power supply to Raspberry pi and it effectively utilizes 5v supply power even it decreases to 3.3v, 1.8v and 1.25v with the voltage regulator.

3) Raspberry pi Camera

It was connected to the CSI port of the board with a 15 pin Ribbon. This was sketched out especially for interfacing to cameras. It has the limit pass on extent 5MP determination picture or 1080PHD feature recording at 30fps (packaging/sec).

Figure 2: Raspberry Pi Camera

4) 52 Inch Virtual Display Glasses

52 inch 4:3 virtual display theatre glasses Comes with 4GB of internal memory and it can be

expanded up to 32GB. These goggles are portable virtual device, which covers 52 inches display at any time. Some of the features and specifications of goggle are.1It can handle a wide-ranging variety of media files. For storing all your favorite media files, it has 4GB of internal memory as well as a micro SD / TF card slot can be extended up to 32GB.

It is lightweight glasses and enough comfortable to wear for extended periods of time and it can easily carry.

Figure 3: Display glasses

B. Software Design

In this project we are using MATLAB software with the help of this software, we installed hardware supporting package for raspberry pi and then we draw a Simulink connections. The programming is developed in Matlab, Simulink which supports the Raspberry Pi hardware supporting packages. The programming is done.

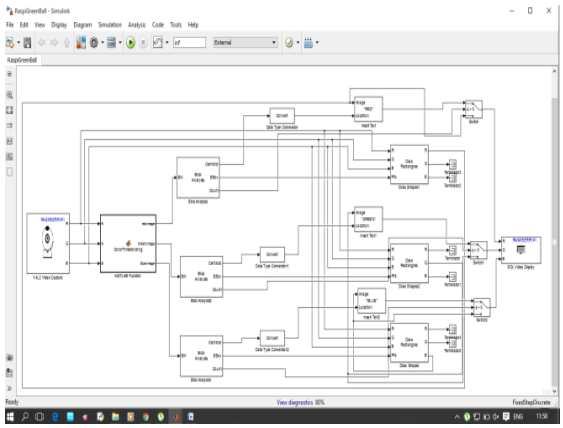

Figure 4: Simulink Block

IV. PROPOSED METHOD

This method is proposed to provide the convenience to the patients suffering from achromatopsia. In this method fuzzy color discrimination method is used to provide the details of color that is identified in video streaming. This video streaming is displayed on video glasses and the processing for identification and labeling of color is done by using raspberry pi. The work is carried to provide a handheld device for the patients suffering from achromatopsia to learn, identify and discriminate the different colors.

The proposed method is to identify the color regions and label the red, blue, green colors. The identification of object and labeling of color is done in this method. The algorithm proposed in started below.

Step1: obtain the video stream using raspberry pi camera.
Step2: the fuzzy logic depends upon the discrete values in the range from zero to one. In this context select the threshold values of three colors Red, Green and Blue.
Step3: Now perform in subtract () function from the frame to obtain red component from the image.
Step4: Apply median filter to remove noise component from image.
Step5: Convert the image into binary image by considering the threshold values of red, green, and blue.
Step6: Perform blob analysis to obtain the region of interest of object.
Step7: Obtain the centroid values of the colored object i.e., centroid value of red, green, and blue color objects in the image.
Step8: By using text inverter function of matlab, indicate the color component identified.
Step9: The result with indication of color name on object is seen using video glasses.

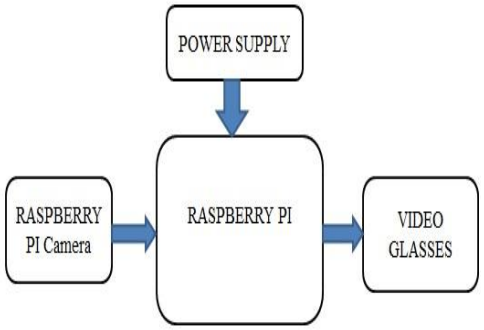

Figure 5: Block Diagram

These are the steps that are performed to obtain the color name or object that will provide act as guiding handled device for patient suffering from achromatopsia. This handheld device will guide the color blind people to justify the color of object.

V. EXPERIMENTAL RESULTS

On Assembling, configuring and executing the Simulink it is being identified that the hand held device

designed provides the results that are expected by identifying the Red, Green, Blue color objects and also label the color names for the objects. The system designed how can be used as hand held gadget that can act as guidance tool to justify the color representation. The results of the real-time system designed are shown in figure1 and 2. The software implementation of the system is done by using MATLAB Simulink. The system designed acts as standalone design to be used for this application.

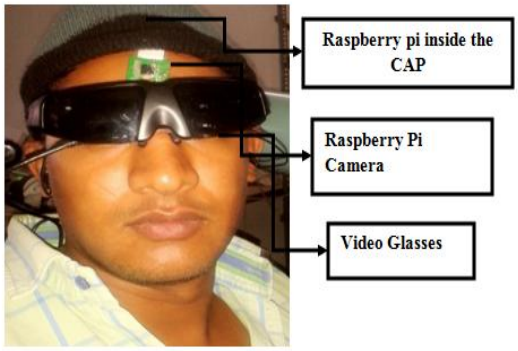

Figure 6: Application Setup

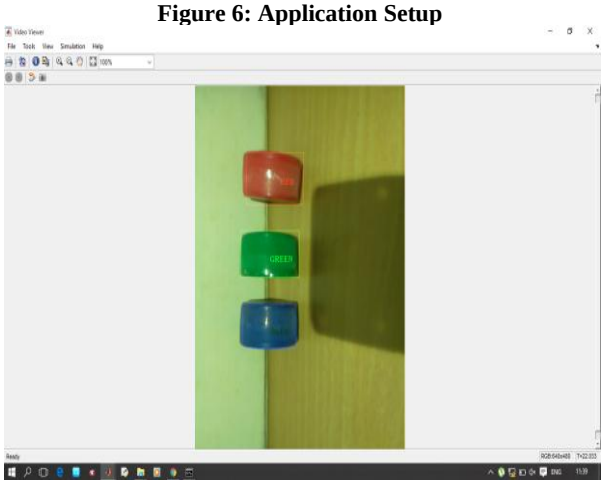

Figure 7: Color Detection

VI. CONCLISION

Color blind is a serious and severe problem now a days, characteristics and difficulties are recognized and studied for individual color blind. A robust real-time system is developed and tested to recognize and label colors by using Raspberry-pi B model which acts as standalone device, which is cheaper in cost easier to carry. Matlab Simulink is utilized to develop the Simulink to recognize the color of an object and also it labels out object color. Complexity is reduced when compared to the previous work. Test was done and satisfied with some standard (RGB) colors in a simple way, to execute this research work.

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